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American Journal of Diseases of Children

VOLUME 33 APRIL, 1927 NUMBER 4

THE INTRACRANIAL TUMORS OF PREADOLESCENCE *

REPORT OF A CLINIC FOR THE COMBINED MEETING OF THE PEDIATRIC SECTION OF THE NEW YORK ACADEMY OF MEDICINE, THE PHILADELPHIA PEDIATRIC SOCIETY, AND THE NEW ENGLAND PEDIATRIC SOCIETY, HELD AT THE PETER BENT BRIGHAM HOSPITAL, BOSTON, OCT. 16, 1926

HARVEY CUSHING, M.D.

BOSTON

Gentlemen: I was the more ready to accept Dr. Sisson's invitation to address you because of a letter recently received from a distinguished neurologist in a distant city. Relative to a chapter on nervous diseases he is preparing for a general textbook of pediatrics, he wrote to ask if we had ever seen any recoveries after the removal of tumors of the brain in children, adding that in his personal experience the operations were either fatal or gave bad results.

It is fair to say that the operations on children are in the long run less favorable than those on adults, for reasons that will be pointed out. Nevertheless, the results are excellent, as I think you will come to admit. Otherwise, one would hardly be willing to devote his life to such a business. Moreover, the results improve year by year as our diagnostic acumen is sharpened and as our knowledge of the life history of the lesions increases.

My accredited title, "Neurological Surgery in Childhood," is far too broad to think of compassing in a single clinic. Even the tumors of the central nervous system, to which I shall confine my remarks (for these are the most commonly overlooked lesions and for that reason the ones that should most interest you), would be beyond the possibilities of an hour's exercise.

What I plan to do is to parade for you all the patients under 15 years of age that happen at this time to be in the hospital, either awaiting operation or convalescing after operations for tumor. This will give you an idea of the conditions with which we deal and of the immediate results.

I will subsequently show a few patients from the neighborhood who have been good enough to report for the purposes of this exercise, so that we may learn something of the more favorable end-results.

* Received for publication, Jan. 27, 1927.

INCIDENCE OF TUMORS OF THE BRAIN IN CHILDHOOD

As a point of departure, Dr. Louise Eisenhardt, who for the past several years has kept personal track of our tumor series, has put on the board three tables (tables 1, 2 and 3). The figures are restricted to the cases in the Brigham Hospital series in which the exact nature of the lesion has been histologically verified.

The series all told, from Oct. 1, 1913, to Oct. 1, 1926, comprises 1,108 verified tumors, approximately 600 cases of undoubted tumor but in which the nature of the lesion is undetermined, and about an equal number in which the patient once was, or continues to be, only under suspicion of harboring tumor, for the symptoms in many forms of tumor may show great chronicity.

The tabulations before you, however, as I have said, concern only those cases which have been verified up to the first of the present month. To keep such a list up to date, with its shifting diagnoses due to successive operations, and to follow the patient to the end, particularly should the lesion not have been verified till then, is no mean task when one is dealing with such large numbers of cases. The busy staff of a hospital record room could not possibly give the time necessary for such details. They do well enough merely to file and index our surgical cases in general, and can hardly be expected to engage in biometrical researches of which this is a form.

TABLE 1.—The purpose of this first table, in which as in table 2, the lesions have been listed in their main groups, is to compare the incidence of tumors in childhood with that for the later years of life. The figures are given for half-decades so as to permit the dividing line to fall at 15 years of age.

The table, to be sure, gives merely the number of verified preadolescent tumors encountered in what is essentially an adult clinic, for the Peter Bent Brigham Hospital does not have a special children's ward and does not need one in view of a close affiliation with its most friendly and cooperative neighbor. However, only a small percentage of the 154 preadolescent cases have been referred to us from the Children's Hospital, since children with symptoms suggesting tumor are apt to be sent here direct. Hence the proportion of one tumor in childhood to about six in adult life may be taken as fairly reliable unless in children many more tumors go unrecognized than in adults. This may well enough be the case.

We may learn from the table that only two or possibly three types of tumor in childhood need particularly concern us. The meningiomas and the acoustic tumors, which together represent about 20 per cent of all cases of tumors, are, as you will see, essentially tumors of adult life, and this is true also of the pituitary adenomas which represent another 20 per cent. Hence about 40 per cent of all tumors are practically

TABLE 1.—*Verified Tumors of the Brain at the Peter Bent Brigham Hospital to Oct. 1, 1926, Sorted into Hemidecades According to Age at Entrance*

Diagnosis	Under 15 Years				Over 15 Years															Grand Total
	1-5	5-10	10-15	Total	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	Total	
Gliomas (varia)	15	48	53	116	38	36	33	40	44	58	42	30	19	11	3	..	..	..	..	354	470
Pituitary adenomas	..	..	2	2	3	28	21	38	34	31	31	17	10	6	1	..	..	..	..	220	222
Meningiomas	..	1	1	2	2	5	13	14	16	25	18	13	16	10	1	..	..	..	1	134	136
Neurinomas (acoustic)	..	..	1	1	2	6	18	9	17	15	18	7	9	3	..	1	..	..	..	105	106
Congenital tumors	4	4	13	21	11	9	7	5	4	6	1	3	2	2	..	..	..	..	..	50	71
Invasive and metastatic	..	..	1	1	2	1	1	2	3	6	7	6	3	1	2	..	..	..	..	34	35
Blood vessel tumors	2	..	..	2	..	3	2	7	2	..	2	1	1	2	..	..	..	..	..	20	22
Tuberculomas	2	4	..	6	..	3	1	2	..	1	2	1	..	..	..	..	..	..	..	10	16
Syphilomas	..	..	..	..	..	2	..	1	2	1	..	1	1	..	..	..	..	..	..	8	8
Papillomas	1	..	..	1	..	1	2	1	..	..	..	1	1	..	..	..	..	..	..	6	7
Miscellaneous	..	..	2	2	1	3	2	..	..	3	2	1	..	..	1	..	..	..	..	13	15
Totals	24	57	73	154	59	97	100	119	122	146	123	81	62	35	8	1	..	..	1	954	1,108

TABLE 2.—*Verified Tumors of the Brain at the Peter Bent Brigham Hospital to Oct. 1, 1206, According to Situation*

Diagnosis	Under 15 Years							Over 15 Years							Grand Total
	Cerebral	Cerebellar	Cerebello-pontile	Pontile	Pituitary	Skull	Total	Cerebral	Cerebellar	Cerebello-pontile	Pontile	Pituitary	Skull	Total	
Gliomas (varia)	36	77	..	3	..	..	116	278	63	5	8	..	..	354	470
Pituitary adenomas	..	..	..	..	2	..	2	..	..	..	..	220	..	220	222
Meningiomas	2	..	..	..	..	..	2	112	8	2	..	11	1	134	136
Neurinomas (acoustic)	..	..	1	..	..	..	1	..	..	105	..	..	..	105	106
Congenital tumors	1	2	..	..	18	..	21	14	2	..	..	34	..	50	71
Invasive and metastatic	..	..	..	..	..	1	1	29	1	..	..	..	4	34	35
Blood vessel tumors	1	1	..	..	..	..	2	12	7	..	..	..	1	20	22
Tuberculomas	1	5	..	..	..	..	6	3	6	..	1	..	..	10	16
Syphilomas	..	..	..	..	..	..	..	5	..	..	..	1	2	8	8
Papillomas	1	..	..	..	..	..	1	1	5	..	..	..	..	6	7
Miscellaneous	2	..	..	..	..	..	2	10	1	1	..	..	1	13	15
Totals	44	85	1	3	20	1	154	464	93	113	9	266	9	954	1,108

excluded from the children's list. We are reduced, therefore, to the consideration: (1) of a large block of *gliomas* which at first sight seems discouraging; (2) to a small group of *congenital tumors,* and (3) to a few *tuberculomas.*

Figure 1 shows more clearly than the table that the peak for tumors of the brain, as plotted on the basis of the age on admission to the hospital, is reached between the ages of 40 and 45, which more or less closely agrees with the age incidence for tumors of other sorts. You will observe a slight break in the ascending curve corresponding to the 15 to 20 year period. For this I have no explanation to offer. It may be purely accidental. For the rapid drop in the incidence after 45 there are many obvious causes.

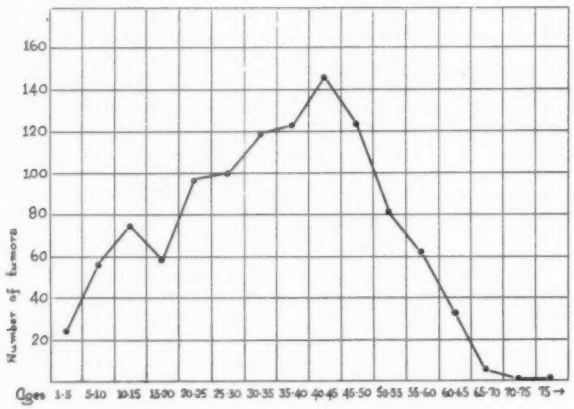

Fig. 1.—Graph of 1,108 verified intracranial tumors plotted in hemidecades.

TABLE 2.—Here the 1,108 tumors have been listed according to their anatomic situation. The table serves to show, among other things, the relative predominance of cerebellar over cerebral lesions in childhood, the proportion being about 2 to 1, whereas in adults it is about 1 to 5. Even should we exclude the acoustic neuromas in the calculation, they being essentially tumors of adult life, the proportion for the cases in adults would still be more than 2 to 1 in favor of the cerebrum.

Let us now return to a consideration of the three larger groups of the preadolescent tumors. We may take them up in the inverse order of their numerical importance, and thus turn our attention first to:

Tuberculomas.—It is possible that solitary tubercles are more often encountered in children's hospitals and, owing to a suspected meningitis, may not be thought suitable for operation. It may also be possible that in this country the lesion is less common than in some others. However, the fact that only six of the sixteen verified tuberculomas should have

occurred in children comes as a surprise, particularly when one recalls the older statistics relating to tumors of the brain in childhood.

I allude particularly to the tabulation by Starr [1] in which approximately 50 per cent of all the tumors of the brain in childhood were recorded as tuberculous. His list follows: tuberculomas, 152; gliomas, 37; sarcomas, 34; gliosarcomas, 5; cysts, 30; carcinomas, 10; syphilomas, 2; no diagnosis, 30; total, 300. We may well hope that the altered figures of the present day are an indication of the fact that tuberculosis in general is on the wane. However, it must be realized that a good many tuberculomas encountered in the course of operations for tumor in childhood are not histologically verified and so would not appear in these tables. The preferential treatment of these lesions has been discussed in a recent paper from the clinic,[2] and I shall have the opportunity to show you two cases this afternoon in which decompression only was done and the lesion, though exposed, not histologically verified.

You will see from table 2 that the cerebellum is the seat of predilection for these solitary tubercles, in both children and adults, and in our experience they, in the long run, do better when the lesion is not meddled with other than to give it room. The prognosis at best is bad, much worse than in the case of most true neoplasms.

Congenital Tumors.—Though far less numerous than the gliomas, these need a word of comment, familiar as they doubtless are to all of you. The majority of them are suprasellar lesions arising from an anlage of Rathke's pouch. They seriously interfere with the function of the pituitary body, producing marked secondary constitutional symptoms. All of them have of course existed from birth, in spite of the fact that only twenty-one of the seventy-one patients having congenital tumor came into the clinic because of symptoms arising during childhood.

Undoubtedly in many of the thirty-four cases of pituitary tumor in adults the lesion could have been recognized at an earlier age had there been reason at all to suspect tumor. In about 80 per cent of the cases, the walls of the cyst become calcified and cast shadows in the roentgenogram. They, however, are more easily diagnosed than treated. There happens to be an example at present in the wards that we shall see.

Gliomas.—These in their importance outweigh all others. Our growing list of tumors, including all tumors for all ages, has shown for years a fairly constant 42 per cent of gliomas, but the tables make it clear that they are proportionately more numerous in the preadolescent years of

1. Starr, M. A., in Keating's Cyclopaedia, 1890.
2. Van Wagenen, W. P.: Tuberculoma of the Brain. Its Incidence Among Intracranial Tumors and Its Surgical Aspects, Arch. Neurol. & Psychiat. **17:** 57 (Jan.) 1927.

life. They actually represent 75 per cent of the 154 recorded cases in childhood and only 37 per cent of the 954 cases in adults.

TABLE 3.—Though a subdivision of the gliomas into their various types is a matter just now of greater concern to the expert neuropathologist than to the clinician, Dr. Eisenhardt has, in the third table, listed in fifteen-year periods the gliomas occurring in the Brigham Hospital in accordance with Dr. Bailey's [3] tentative classification of these lesions. It is not important for others than those engaged in special studies of the gliomas to master the complicated terminology, which almost certainly can be improved and simplified, but for the time it serves as our working basis. What is important for you to appreciate is that *not all gliomas are seriously malignant tumors,* in spite of the commonly held impression.

TABLE 3.—*Verified Gliomas in Fifteen-Year Periods According to Age at Entrance*

Diagnosis	Under 15 Years, 1-15	Over 15 Years 15-30	30-45	45-60	60-75	Totals	
Unclassified							
Verified by cyst fluid alone	10	11	16	9	..	46	
Gliomas of optic chiasm	8	4	..	1	..	13	
Gliomas of pons and brain stem	2	3	4	..	..	9	Average
Atypical and transitional gliomas	6	3	7	3	3	22	Survival
Differential study impossible	9	19	18	15	..	61	Period
Classified							in Months
Medullo-epithelioma	..	1	..	1	..	2	8
Spongioblastoma group	7	19	38	38	9	111	12
Medulloblastoma	24	10	4	1	..	39	17
Pinealoma group	4	5	1	..	..	10	18
Neuroblastoma	..	..	2	..	..	2	25
Ependymoma group	6	5	3	..	..	14	25+
Astroblastoma	..	2	7	3	1	13	28+
Oligodendroglioma	..	3	5	2	..	10	66+
Astrocytoma group	40	22	36	18	1	117	72+
Ganglioneuroma	..	..	1	..	..	1	?
	116		354			470	

In this connection I may call particular attention to one or two points in table 3 so that you may be able properly to "place" the patients that you are shortly to see. The classified gliomas in the lower part of the table are here listed in the order of their diminishing malignancy. Those at the top of the list have the shortest expectancy of life, those nearer the bottom the longest. In the last column is given, in months, the estimate of the average survival period for the several types of glioma, based on a previous detailed study of the end-results of the consecutive series of 254 classified gliomas for all ages up to January, 1924. For your information as pediatricians, I may briefly call attention to the three larger groups—the spongioblastomas, the medulloblastomas and the astrocytomas.

3. Bailey, P., and Cushing, H.: A Classification of the Tumors of the Glioma Group on a Histogenetic Basis with a Correlated Study of Prognosis, Philadelphia, J. B. Lippincott Co., 1926, pp. 175.

The *spongioblastomas* represent the highly malignant and rapidly growing gliomas of adult life and usually occur in the cerebrum. They are probably no less malignant than the medulloblastomas, but an actively growing tumor below the tentorium is naturally more quickly fatal than one which arises in the cerebrum. Since less than 1 per cent of them (seven of 111 cases) occur in childhood, we need not delay over them.

The medulloblastomas are, as Bailey and I [4] have described, essentially tumors of childhood, and usually occur in the midcerebellar region, having arisen from the roof of the fourth ventricle. Hence they are not only rapidly growing tumors which tend to recur, but they commonly arise in the worst possible place to endanger life. We have estimated (probably too conservatively) that the patients give, on the average, a six months' preoperative history, and do well, on the average, for six months after operation. We have kept one child going for five years, but this is exceptional. I will show you a patient recently operated on by a more radical preliminary step than in the past we have ventured to take. Beyond question we will come to get much better results now that we know in the majority of cases what we are to deal with before the child comes under operation.

The *astrocytomas,* which are of two types, fibrillary and protoplasmic, have an infinitely better prognosis than the foregoing, though they too are most commonly tumors that arise from over the fourth ventricle and therefore present much the same surgical problem as do the medulloblastomas. They also are predominantly tumors of preadolescence, the fact that nearly twice as many (seventy-seven to forty) have been encountered in adult patients being unquestionably due to their slow growth.

Though it may be a desperate matter to remove them successfully, the fact that the average survival period has been more than seventy-two months (six years and more), in spite of several operative fatalities in years gone by, speaks well of their relative benignity. Since they are nearly twice as common in childhood as the medulloblastomas (forty to twenty-four), we have *a two-to-one chance of finding usually in the midcerebellar region of children a surgically* favorable glioma if we can properly perfect our methods of dealing with it. That is, of course, a matter for which the neurosurgeon must be held responsible, and it is inconceivable that those not specially trained should ever undertake these difficult and dangerous operations which require a special technic of their own.

To make still more evident the relative predominance of the cerebellar gliomas in childhood and of cerebral gliomas in adults, the curves that are shown in figure 2 have been plotted.

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4. Bailey, P., and Cushing, H.: Medulloblastoma Cerebelli. A Common Type of Midcerebellar Glioma of Childhood, Arch. Neurol. & Psychiat. **14**:192 (Aug.) 1925.

THE PATIENTS IN RESIDENCE

It would be a matter of extreme interest and perhaps of importance to the profession in general, should some one some day tabulate the early mistakes in diagnosis and the early and unnecessary operations to which tumor cases, particularly those in childhood, are prone to be subjected. I have this very morning been agonizing over a patient on whom I hesitate to operate because he is already blind and practically moribund from a wide intracranial extension of a simple pituitary adenoma, long diagnosed and treated as encephalitis—all for the want of a proper roentgenologic study.

It is an old adage that the doctor who makes no mistakes has no patients. This applies to all of us, but in respect to these tumors of childhood one feels sometimes disheartened to find that the appendix

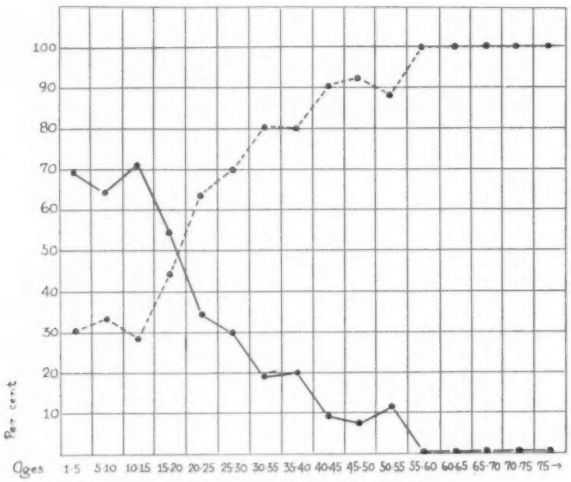

Fig. 2.—Cerebral (dotted line) and cerebellar (solid line) gliomas plotted in hemidecades according to percentages and showing the predominance of cerebellar gliomas in childhood and of cerebral gliomas in adults. The curve is only slightly modified even if all varieties of tumor should be included.

can still be removed for cerebellar vomiting, not to speak of tonsils and adenoids, and that spectacles may be prescribed or ethmoid operations performed for an existent choked disk. And so far as the old-time course of antisyphilitic treatment for diagnostic purposes is concerned you may learn from table 2 that syphilomas are unrecorded in children and constitute only a fraction of 1 per cent of the tumors in their elders.

I well appreciate the difficulties of early diagnosis of tumors in childhood and realize, too, that by the time the patients enter a surgical clinic, the existence of the lesion may be quite unmistakable; so that what remains for us is largely a matter of localization and of decision as to the best method of dealing with the lesion. I wish also to say, in behalf

of the practicing physician, that the percentage of blind patients that are today admitted to the clinic is far smaller than it used to be. Hence, in retrospect, a vast improvement has taken place in the matter of early diagnosis.

REPORT OF CASES

CASE 1.—The first of these patients illustrates unusually well the diagnostic vicissitudes that confront a child with tumor. She was discharged last Monday with the request that she return for this clinic. Before she comes in I will read some extracts from the mother's diary which was submitted in lieu of the anamnesis on the child's admission six weeks ago. The patient is Mary B., one of twins, now 4½ years of age. The physicians' names are given in ABCD fashion in the diary, which follows:

June 10, 1925: Mary sick with fever and a little cough. Dr. A gave her urotropine and a syrup for what he said was a touch of laryngitis.

June 14, 1925: Mary out of bed, but seems weak and walks queerly with her left leg. Says she has no pain.

June 15, 1925: Mary's leg seems worse. Called up Dr. A and said I feared she had infantile. He told me to forget it.

June 16, 1925: Insisted on Dr. A seeing Mary in the morning, and he told me to take her to Dr. B, who went over her and said he thought it was a throat infection that had settled in her joints.

June 18, 1925: Called up Dr. B to say that Mary was no better. Said he was leaving town and if she got worse to consult an orthopedist.

June 19, 1925: Took Mary to Boston to see Dr. C, who agreed with Dr. B's diagnosis of infection which had settled in her joints. He bandaged her ankle and said to treat her as a normal child.

June 22, 1925: Summoned at 7 a. m. by nurse: Mary had twitching of her left side. Called Dr. A by telephone. He said it was nothing to be alarmed about. Ditto Dr. C. In the afternoon there was a recurrence of twitching, and we called Dr. D, an orthopedist of Boston, to come the next morning to see her.

June 23, 1925: Dr. D with Dr. A examined Mary and said it was infantile with a possibility of tubercular meningitis. I then telephoned Dr. E, a friend in New York, to come and see Mary. Also called Dr. F, a personal friend, who thought she should be taken to a hospital in Providence for examination. There Dr. G examined Mary and pronounced it infantile paralysis.

June 25, 1925: Dr. E came over from New York and advised that she stay in hospital, though he did not believe it was infantile.

July 6, 1925: Dr. B returned from his vacation. Found Mary drowsy. Did a lumbar puncture and also a tuberculin test. Both were negative.

July 14, 1925: We brought Mary home.

July 15, 1925: Mary came down with chickenpox which she had picked up in the hospital. I noticed that day that she was not using her left arm as well as the other.

Aug. 12, 1925: Dr. E came on from New York to visit us and suggested that Mary's leg should be massaged to reexercise the muscles, and he chalked places on the floor for her to walk on.

Aug. 19, 1925: Dr. B came to consult with Dr. E and they advised an electric battery and massage. I asked them about her arm, and they thought I was imagining things.

Toward the end of August or the first of September, Mary could not move her arm for a time at all.

Sept. 20, 1925: Dr. H, an orthopedist, was brought by Dr. B to see Mary. He pronounced the case infantile paralysis and saw her once a week for the next three months.

Dec. 1, 1925: Mary's arm twitched four times during the night. Dr. H came to see her and thought he had better call a neurologist. We agreed.

Dec. 4, 1925: Dr. I, a neurologist, came with Dr. H and said Mary did not have infantile but an inflammation of the cortex of the brain. He thought Dr. H was doing all that could be done. By Christmas Mary could lift her arm elbow-high.

Jan. 28, 1926: Mary has German measles. Electrical treatments have been omitted and her arm is being massaged and apparently improving.

Feb.-Aug., 1926: During the winter she had frequent sick spells with vomiting every week or ten days. About the first of March the twitching of the arm grew less and by the middle of March finally ceased. In May, asked the doctor if he did not think Mary's head was getting larger. He told me I was imagining. I bought hats for the twins and we went to the mountains on June 24. By July 29, Mary could not wear her hat and by the 31st of August it could hardly be put on her head at all, whereas her sister's hat fitted perfectly. During the summer she gained 4 pounds and seemed to be in good spirits except for the vomiting spells.

Aug. 17, 1926: Mary drowsy and vomiting and left arm again twitching. Dr. B came down and said she had a touch of acidosis. He suggested that I ask Dr. J, an orthopedist of Boston to see her.

Aug. 24, 1926: Dr. J and Dr. B came to see Mary. Dr. J said that it did not look to him like infantile. He examined her head and found a soft spot on the right side. Advised an X-ray and another lumbar puncture.

Aug. 25, 1926: Took Mary to Dr. K for X-ray pictures.

Aug. 27, 1926: X-ray pictures showed evidence of pressure. Dr. B did another lumbar puncture which showed normal fluid.

Aug. 29, 1926: Mary has fever and does not feel well. I persuaded Dr. B. to ask Dr. L for an appointment.

Aug. 31, 1926: Took Mary to see Dr. L.

So much for this illuminating maternal diary.

Objectively, on admission, the child showed a palpable elevation of the right parietal region in which there was definite craniotabes. The skull had a cracked-pot sound to percussion. There was a bilateral choked disk of about 2 diopters; a left hemiparesis involving face as well as extremities, with considerable spasticity in the arm; exaggerated deep reflexes with sustained patellar and ankle clonus and a positive left Babinski sign; the left leg showed slight atrophy. The house officer's diagnosis was a right parietal lesion, probably tumor.

An osteoplastic exploration on Sept. 6, 1926, exposed an enormous tumor which, though nodular, was fortunately encapsulated. The growth was firm and its central portion, amounting to 129 Gm., was removed. It was about all that the child could stand—indeed it was a close call.

On September 11, at a second-stage operation, the remaining peripheral portions of the growth, which weighed 144.5 Gm., were dislodged and removed apparently intact. It was again a close call, and transfusion had to be performed.

The total weight of the growth, which you will see has been pieced together (fig. 3), was therefore 273.5 Gm. Anything above 200 Gm. is an exceptionally large tumor. It proves to be a rare type of growth of an obscure sort, which will fall, in our classification, under miscellaneous. It does not belong in the glioma series, and resembles histologically a fibrosarcoma.

The child [she walks in] as you may now see has made an excellent recovery with some residual spasticity in her left arm and leg. This is improving daily and is already much less marked than before operation. She gets about actively and alone on her feet. Fortunately the growth

was in the right hemisphere. We cannot always do as well as this, with a lesion unrecognized for so long a time.

We may now turn to our parade of the nine children with tumor or presumptive tumor now in the hospital. The first two are awaiting operation.

CASE 2 [Child sitting up in a crib].—Phyllis Wilson was admitted two days ago with the history of perfect health until five months ago when the mother noticed that she was becoming unsteady in gait. This has grown

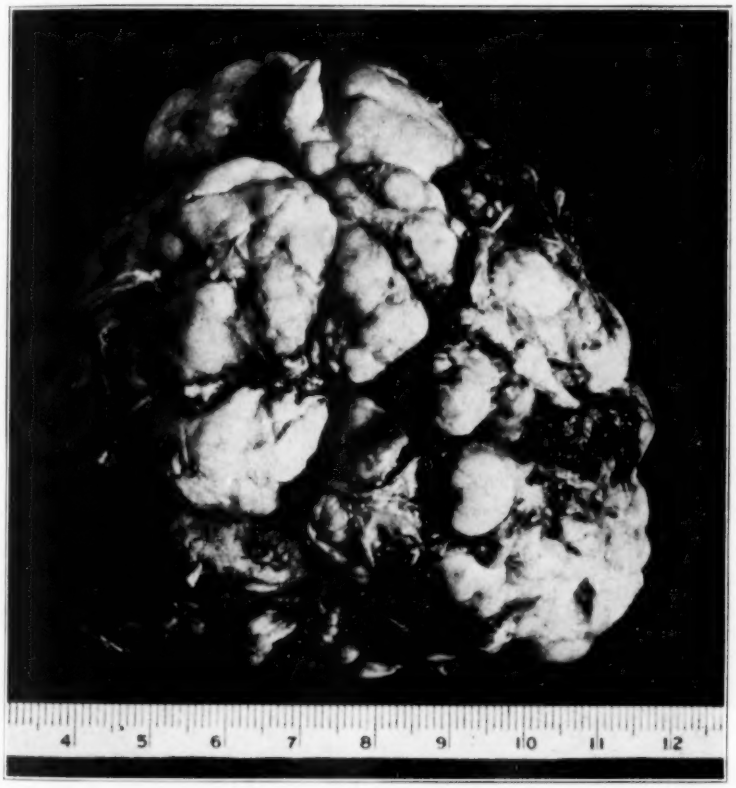

Fig. 3 (case 1).—Two hundred seventy-three grams of cerebral tumor in patient whose condition was variously diagnosed for a year or more.

progressively worse, and since July she has been unable to stand on her feet. She is now 24 months old. She has never complained of headaches and has not vomited.

The mother observed also that the child's head was growing unduly large, and mentioned the fact to her physician who said that all children's heads were large. Moral: Don't ignore the parents' impressions about their children.

Objectively, the skull gives a cracked-pot (Macewen) sound on percussion and shows, as you may see from the roentgenogram, evidence of convolutional pressure. The eyegrounds are difficult to examine but apparently show some pallor. There is no nystagmus. As you can see by the way she handles her toys, there is definite incoordination in the arms.

I doubt whether we shall get anything more by further studies of this child. On the basis, largely, of the anamnesis, the evidences of hydrocephalus, the obvious incoordination of cerebellar type and absence of nystagmus, we may assume that she has a median cerebellar tumor, a medulloblastoma in all probability.

Subsequent Note.—We were badly misled in this case. The child was operated upon, October 22. The usual extensive, bilateral, suboccipital exposure was made. The puncture of the ventricle disclosed hydrocephalus under marked tension. When the cerebellar dura was incised, a mass of dense arachnoid adhesions was disclosed surrounding and plastering the cerebellar tonsils, the foramen of Magendie and the upper cord. In order to free these dense adhesions and to get fluid communication with the spinal meninges, a laminectomy of the atlas was performed. It was finally possible to burrow through the adhesions and to establish a new foramen of Magendie just above the region of the calamus. The fourth ventricle itself proved to be enormously dilated and probably acted like a cyst in producing the cerebellar syndrome.

The child did well for ten days and then had a sudden unaccountable rise in temperature to 105. A combined lumbar and ventricular puncture revealed cloudy fluid under tension, but cultures proved to be negative. She died with symptoms of meningitis on November 3. The autopsy showed an unsuspected acute otitis media with mastoiditis (streptococcus) and secondary bacteremia.

Case 3 [Walks in unattended].—This is Grace Chadsey, aged 9. One would hardly suspect from her appearance that there can be anything the matter with her. Briefly this is her story:

Three months ago she fell out of a swing, striking her head. She subsequently walked home, a distance of three blocks, unsteady gait being noted at the time. She began vomiting and soon had diplopia and dizziness, also headaches coming on at various times, accompanied by vomiting unassociated with nausea. All of these symptoms were naturally attributed to her fall.

She was admitted to the Medical Service of the Children's Hospital on September 29, and was referred here a week later. She looks well; has no complaints, and plays happily about the ward. There is one thing seriously wrong, however, but you have to look for it with the ophthalmoscope. She has a high grade of choked disk. Just now there is little else to show for her trouble. In addition to some suboccipital tenderness and to slight nystagmus, the neurologic examination is practically negative. Only occasionally has some slight unsteadiness of gait been apparent.

This child almost certainly has a midcerebellar tumor, and on the grounds of probability of table 3 almost certainly a glioma, either a medulloblastoma or astrocytoma, I hope for her sake the latter. I take it for granted that you all use an ophthalmoscope. Its neglect breeds trouble. One can roughly estimate fever and pulse rate and blood pressure without instruments of precision. One can even get along without a stethoscope and not endanger the patient. But the presence of a choked disk can only be told by looking. Next to the microscope it is the most important instrument to have at hand. It is hard to believe from this child's appearance that she can be harboring a tumor, and without the use of an ophthalmoscope she would certainly have been allowed to become blind.

Subsequent Note.—At operation, on October 20, a large median medulloblastoma was disclosed. It presented between the cerebellar tonsils and extended into the spinal canal so that for its exposure it was necessary to remove the laminae of the atlas and to continue the incision down to the axis. The tumor was removed largely by suction, laying bare the floor of the greatly dilated fourth ventricle with full exposure of the dilated iter. A tag of tumor adherent to the region of the calamus had to be left. The patient made an excellent operative recovery; she was given a single deep roentgen-ray treatment, and was discharged on November 12 (fig. 4).

CASE 4 [Bed-ridden individual].—This progeric patient (fig. 5) looks like the fusion of a child of 10 with a woman of 45. In reality her age is 30. This is her second admission to the hospital. She was here last July, when I sidestepped the responsibility of surgical intervention. She was then fairly com-

Fig. 4 (case 3).—Postoperative appearance of child after extensive removal of medulloblastoma arising from roof of fourth ventricle.

fortable and I did not feel that an operation held out any promise of improving the condition.

She has never developed, never acquired the secondary characters of sex, and ten years ago began to lose her vision. At that time a transsphenoidal operation, impossible to carry out in such a case, was undertaken by one of those general surgeons who rush in where the more experienced fear to tread. Following this operation, the patient began having convulsions which have occured every few months for the last ten years.

She has a primary optic atrophy, near blindness, and the roentgenogram (fig. 6) shows the telltale suprasellar shadow of a congenital cystic tumor. Her height is 57 inches (144.8 cm.); the weight is 60 pounds (27.2 Kg.). She has a basal metabolic rate of —27 per cent. On her former admission, as now, she was incontinent, and the urine could not be measured; but there is no evident polyuria or polydipsia. She was readmitted to the hospital two or three days ago in coma from status epilepticus.

This case serves to emphasize the point I have already touched on, namely, that many intracranial tumors recorded as occurring subsequent to childhood may more properly belong to the preadolescent group. Though the lesion has not been histologically verified there is no question of its nature. Should it come to be verified, it will make another congenital tumor to be recorded in table 1, in the 30 to 35 year column.

I am aware, of course, that you are familiar with these cases, though you may not all realize how common they are. There have been fifty-two verified cases in the series, and I should roughly estimate that at least twenty more patients have gone through the clinic like this poor creature unoperated on because of fairly stationary symptoms.

Fig. 5 (case 4).—Appearance at previous admission of patient, aged 30, with craniopharyngeal-pouch cyst.

What she chiefly needs is treatment by pituitary substitution. This we cannot give her until the biochemist isolates for us the active principle of the anterior lobe. When that happy day comes we can stimulate growth in such a condition as this, for though she is over 30 you will see from the roentgenogram of her arm that the epiphyses are ununited.

It is futile to prescribe hypophysial extracts by mouth, and it is too late, I fear, to do anything surgical in this particular case in the hope of restoring vision. She has no general pressure symptoms. All told, it is a difficult therapeutic problem.

Subsequent Note.—The patient went from bad to worse and for a month remained in a semicomatose condition. Finally in desperation, on November 27, an osteoplastic frontal exploration was made. The calcareous portion of the tumor was surmounted by an unexpectedly large cyst containing 75 cc. of coffee-colored fluid rich in cholesterin. Improvement did not follow the evacuation of this cyst. Indeed, her thermoregulatory mechanism was upset, and subsequently her rectal temperature registered often as low as 94 F. Her death, on December 9, may be ascribed to efforts by the external application of heat, to keep up her body temperature. This at least has been found to be disastrous as a treatment for the low temperatures of experimental canine hypopituitarism.

Fig. 6 (case 4).—Sella turcica, showing the calcareous portion of the suprasellar cystic tumor.

We now come to the five children at present in the hospital who have already been operated on. The first of them is rather a pitiable object at present, though he is improving and we have hopes for his recovery.

Case 5 [Bed case].—Frank Calarco is a French-Canadian boy, aged 13, sent here from out of town with this story: Following what was called "inflammation of the lungs" three years ago, he had a slow convalescence and was largely confined to his bed for three months with nausea, vomiting and headaches. There was gradual improvement and he got back to school, but he was unsteady in his gait, complained a good deal of stiffness and pains in his neck, and suffered from recurring attacks of vomiting. These symptoms have fluctuated in intensity ever since.

About a year ago his vision began to fail, and he was fitted with glasses. He continued at school in spite of all this, until last June when, during his examinations, his vomiting attacks became much worse. During the summer he was much better, and it was not until September that rapid failure of vision led to his being sent here.

Examination at that time, five weeks ago, showed a frail and under-nourished boy, with evident hydrocephalus confirmed by the roentgen ray. The roentgenograms, as you may see, show markedly separated sutures and convolutional thinning. There was an advanced choked disk with secondary atrophy; vision reduced to light perception; marked suboccipital tenderness, some slight cerebellar asynergia and hypotonicity of the musculature; marked nystagmus.

We expected to find the usual midcerebellar tumor, probably an astrocytoma, in view of the long duration of symptoms.

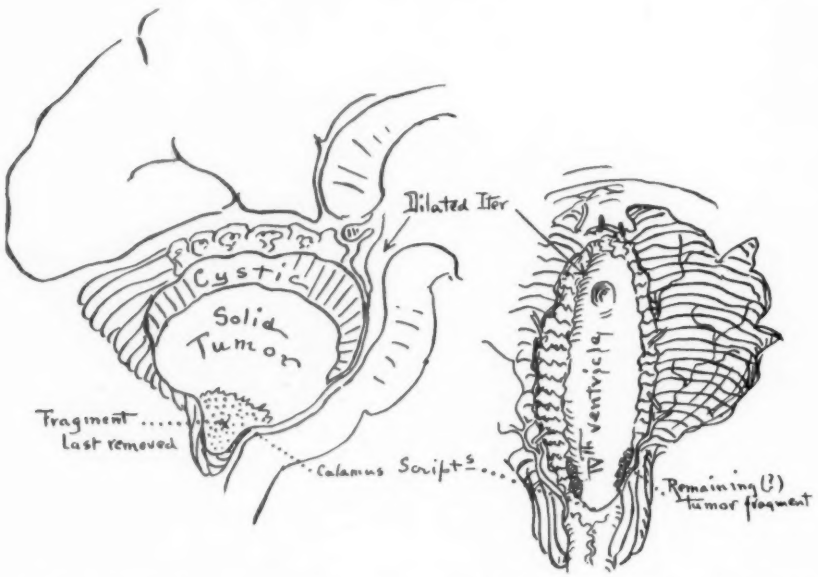

Fig. 7 (case 5).—Postoperative sketches to indicate (left) the approximate relations of the tumor on mid-section of the brain; (right) the general appearance at the conclusion of the enucleation.

A cerebellar exploration on September 15, just a month ago, disclosed a full cerebellum with marked herniation into the spinal cord. A vertical midcerebellar incision opened a cyst within which was a large tumor taking its origin from the roof of the fourth ventricle [*cf.* the operative sketches shown in fig. 7]. The lesion was mistaken for a medulloblastoma, though these tumors are not often cystic, and a much more radical extirpation than usual was attempted. This laid bare the greatly widened floor of the ventricle from the dilated iter nearly to the calamus, in which a nodule of tumor was adherent and had vascular attachments. Owing to the boy's condition I had about abandoned the idea of removing this remaining nodule, for the slightest manipulation caused great irregularity of pulse and respiration. I, however, finally screwed up my courage to do so.

In this final step, in spite of all care, I must have contused the nuclei of the ventricular floor, for he subsequently was unable to swallow or speak and had

a bilateral facial palsy. In consequence, convalescence has been most precarious and nasal feeding has been necessary, but we are now past the worst of it. His wound has healed perfectly; he has regained movement in one side of the face (fig. 8); he can swallow, and is beginning to talk.

A secondary anxiety has concerned his vision, but with the subsidence of the choked disk he fortunately retains in one eye fairly useful sight. Up to the stage when the handling of the tumor caused vomiting, the operation, as is usual, was conducted under local anesthesia. The procedure lasted four and a half hours.

I have gone into these few details in this particular case—and have omitted as many more—to show that these operations are not child's

Fig. 8 (case 5).—Patient five weeks after removal of large cystic astrocytoma from roof of fourth ventricle. The then residual oculomotor and left facial palsies should be noted.

play, and to carry through one of them a day is responsibility enough. It will be of interest to quote a paragraph from the letter of the physician who sent the boy here:

The case [he wrote] is somewhat puzzling. The symptoms at the start were very much those of possible cerebellar neoplasm, but the growth appears to have been slow for that location. There are many things that point also toward a frontal location. Another thing that impresses me as very probable is that he had some type of encephalitis or meningitis in the acute illness three years ago, and because of the tympanic skull and the slowness of the progress of the symptoms I feel that arachnoiditis with external hydrocephalus is to be seriously considered.

This sounds reasonable enough, and I only give the quotation because the character of the lesion solves the puzzle. The growth proves to be a fibrillary astrocytoma which explains its chronicity. Had I been sure of this at the time of operation I would have left the nodule adherent to the calamus, and the boy would have been home by this time.

Subsequent Note.—This boy made a rapid improvement and was discharged on November 4. Reports from his physician state that: he is walking and feeding himself; that his paralyses of the cranial nerves are less marked; that his vision is so far improved that he is able to read large print.

CASE 6 [Bed case].—In contrast to the last case, I wish to show you that these radical operations for gliomas that arise from the fourth ventricle may be successfully carried through without accident. This patient happens to be 18 years old and is therefore a little beyond our 15 year age limit. He was operated on only yesterday, and here is his tumor (fig. 9), or that portion of it which was removed intact, the remainder so far as we could tell having been drawn out by suction.

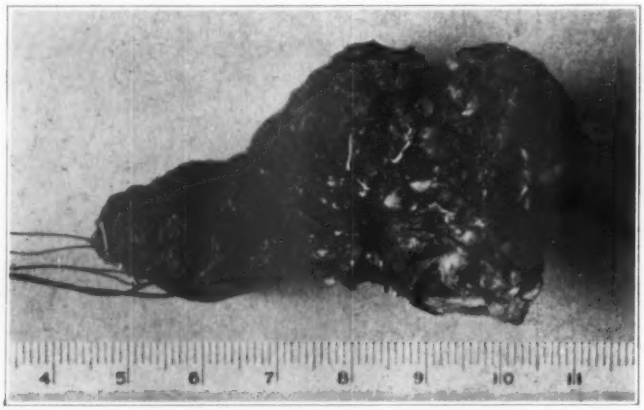

Fig. 9 (case 6).—The pear-shaped tumor (natural size). The threads are attached to the lower pole which presented between the cerebellar tonsils above the calamus.

Joseph Wilcox is a plumber's apprentice who about a month ago first came to the dispensary. There his case was regarded as one of chronic nephritis, his choked disk having been mistaken for albuminuric retinitis. He was finally admitted on October 4 to our medical wards with a tentative diagnosis of "lead encephalopathy." He was transferred to us as a tumor suspect on October 8.

His major symptoms for the past eleven months had been vomiting, with occasional attacks of dizziness and suboccipital headaches. For a month there had been some unsteadiness. From a neurologic standpoint, his marked nystagmus and asynergia should have made the diagnosis unmistakable.

At the operation yesterday a marked foraminal herniation was disclosed, and when the cerebellar tonsils were drawn out of the foramen the lower pole of what proved to be a fairly firm nodule of tumor was brought into view. The cerebellum was then split in a midvertical direction, and a large pear-shaped tumor was enucleated. This procedure was aided by drawing on its somewhat firmer lower portion into which the threads have been tied. As you will see from the operative sketch, which is comparable to figure 7 without the cyst, a hugely dilated ventricle was laid bare just as in the two preceding cases.

From the greatly dilated aqueduct of Sylvius above to the calamus below measured fully 6 cm. Fortunately, the ventricular floor was uncontused.

Subsequent Note.—This patient (fig. 10) made an uneventful recovery and was discharged on November 7, practically free from symptoms, his choked disks flat and normal vision preserved.

CASE 7 [Walks in unattended].—Annie Leonard is 8 years old. She was referred here on September 27 from the outpatient department of the Children's Hospital by Dr. Crothers. She was perfectly well until six weeks before admission when (the story becomes familiar) she began having early morning attacks of vomiting accompanied by temporary headaches. The vomiting, however, has been the major symptom for which she was finally taken to the Children's Hospital.

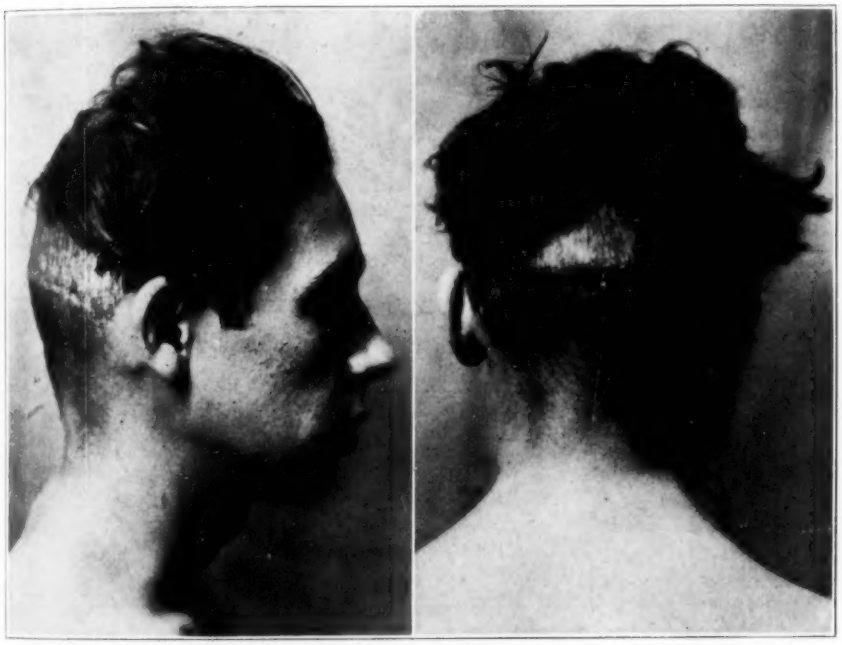

Fig. 10 (case 6).—Patient two weeks after operation for midcerebellar medulloblastoma arising from roof of fourth ventricle.

On admission here she was found to have a choked disk of 5 diopters; nystagmus in all directions; instability and hypotonicity. Her head was somewhat enlarged and gave a cracked-pot sound on percussion. The roentgenograms, as you may see, showed definite hydrocephalus.

She was operated on, September 30, just sixteen days ago. The exposure was somewhat difficult owing to intracranial bleeding. She proved to have a large and excessively vascular midline tumor, which evidently arose from the roof of the fourth ventricle and which was taken to be a perithelioma—one of the comparatively rare blood vessel tumors you will see listed in tables 1 and 2. Because of a marked foraminal herniation, it was necessary to remove the laminae of the atlas in order to get the tumor fully exposed. The appearance of the field is roughly shown in the operative sketch (fig. 11). I felt that the growth was irremovable, and the operation was abandoned as a decompression.

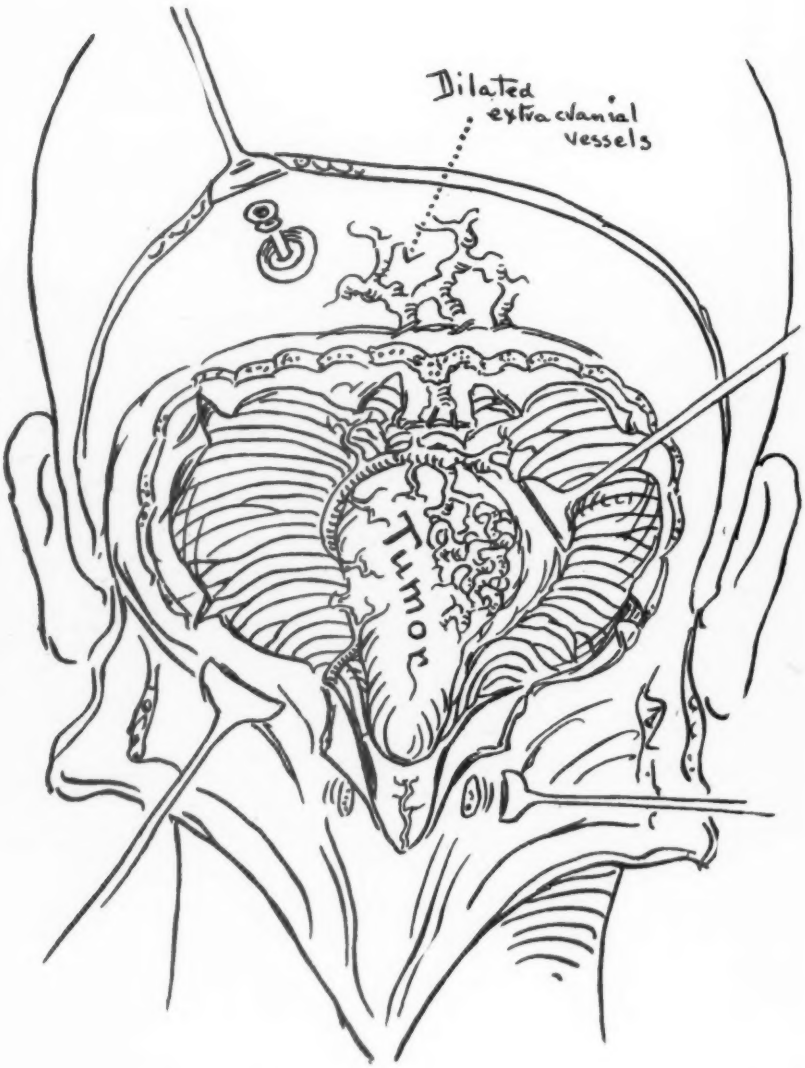

Fig. 11 (case 7).—Rough postoperative sketch to indicate the approximate situation and appearance of the field and operative findings.

She has made, as you see, an excellent recovery (fig. 12). The wound is perfectly healed, the choked disks have subsided, and except for a residual fine nystagmus she is perfectly free from symptoms.

This, then, is an unverified tumor and undoubtedly a relatively benign one. I may have been faint-hearted about it, but I would rather have her here and well, though carrying the tumor, than under the sod. It is one thing to attack a comparatively nonvascular tumor as in the preceding case, even though it necessitates exposure of the fourth ventricle; it is quite another thing to attempt the enucleation of a tumor of this sort.

Fig. 12 (case 7).—Patient two weeks after suboccipital decompression for large perithelioma. In the lateral view the absence of bulging should be noted.

Subsequent Note.—The child was discharged on October 28. She was given a series of deep roentgen-ray treatments and remains (Jan. 1, 1927), except for slight nystagmus, quite without any evidences of the retained tumor.

CASE 8 [Child in wheel-chair].—This fat and sunburned person, Peter Moran, Jr., aged 5, was sent here on September 4 from Worcester, and the following story with some difficulty has been elicited: At 18 months of age a suppurating gland of the neck was incised. At 2 years, his tonsils and adenoids were removed. At 3 years another cervical gland was incised. For the past two years he has had headaches, chiefly occipital, and for the past twelve months frequent attacks of vomiting. Otherwise, "he's always been healthy [sic] until five months ago" when he complained of feeling tired, and his mother noticed that he staggered.

Examination showed a small boy who because of marked ataxia was barely able to stand alone. He had a fullblown and unmistakable cerebellar syndrome pointing chiefly to an involvement of the left hemisphere. There was advanced secondary hydrocephalus with a high grade of choked disk. He had severe headaches, projectile vomiting and marked suboccipital tenderness to pressure.

These are the main facts, and you have probably all made a pathologic diagnosis, which I am somewhat chagrined to say was more than we did at the time.

On September 10, the usual suboccipital exposure disclosed an edematous left hemisphere under great tension in spite of the ventricular tap. A needle was inserted and a firm tumor was detected. When the cortex was incised, the lesion was found to be a solitary tubercle. No attempt was made to remove it.

The boy has made an excellent recovery, with perfect healing of the wound (fig. 13). His headaches and vomiting have ceased; his choked disks are now flat. He has never had any elevation of temperature. He has been given Alpine lamp therapy; he has been kept in the sun as much as possible and has grown fat. As you see, he can now walk fairly well and has become the life of the ward.

Fig. 13 (case 8).—Child with large left intracerebellar tuberculoma (unremoved), three weeks after operation.

Here was an undoubted tuberculoma, which must be listed as "histologically unverified," though it was exposed and identified at operation. Even had the correct pathologic diagnosis been made before the operation, intervention would nevertheless have been indicated to relieve his pressure symptoms. He now will have a chance—though I fear it is a small one—to fight off the disease, and I am glad to say that they are going to take him at the Peabody Home. You will see later a patient who has apparently recovered after a similar palliative procedure. On the other hand, all of the patients in the series from whom a cerebellar tubercle has been removed have died, in from three to six months, of tuberculous meningitis.

Subsequent Note.—This boy has been at the Peabody Home where he continues to do fairly well, now six months since his operation. He, however, is walking less well and his suboccipital wound is bulging.

CASE 9 [Patient in wheel-chair].—Not all of these children have tumors of the brain, though the majority of them do, for spinal tumors are much less common. This little girl, Dorothea Benson, aged 8, was referred from the Children's Hospital on September 8 with a diagnosis of possible syringomyelia. The history is briefly as follows:

In October, 1924, she complained of a stiff neck and had a temporary "torticollis." After eight week of treatment by a local physician at her home she gradually recovered, and remained well until September, 1925, when she had a recurrence of the "torticollis" with pain in the neck. She nevertheless was able to attend school at irregular intervals during the ensuing school year. In July, 1926, after several chiropractic treatments there was an increase in symptoms with a distinct change in the condition — more severe pain and

Fig. 14 (case 9).—Appearance of child on admission with head fixed and rigid in flexed position from an extensive intraspinal glioma.

muscular weakness of the arms. Doubtless under the suspicion that she had cervical Pott's disease, a local surgeon had her wear a Thomas collar.

The most striking thing, objectively, on admission was the curious fixed and rigid position in which she held her head (fig. 14). Any attempt to change this position caused pain. There was an exaggeration of the deep reflexes, muscular weakness of both upper extremities with considerable atrophy, particularly marked in the intrinsic muscles of the hands. There was thought to be some dissociation of sensation, but the sensory symptoms were exceedingly slight and variable. The differential diagnosis lay between cervical Pott's disease (though there were no bony lesions shown by the roentgen ray), syringomyelia and tumor of the cord. Each of these diagnoses had its firm supporters.

The natural recourse of the present day under obscure conditions of this kind would be to make detailed studies of the cerebrospinal fluid, possibly with a combined spinal puncture and the introduction of one of the iodized oils. These diagnostic adjuncts unquestionably may at times add valuable information, but if there are definite indications for operation and a fairly clear localization of the lesion I am always loath to subject patients, particularly children, to preliminary studies of this sort which are sometimes so upsetting as to

turn the scale unfavorably when the operation is subsequently performed. I feel much the same way about the use of ventriculography in cerebral tumors, except as a last resort, and may possibly be overconservative in these matters. Consequently I went ahead with a cervical laminectomy, which, before the end, was extended so as to include all of the cervical and the two upper thoracic vertebrae.

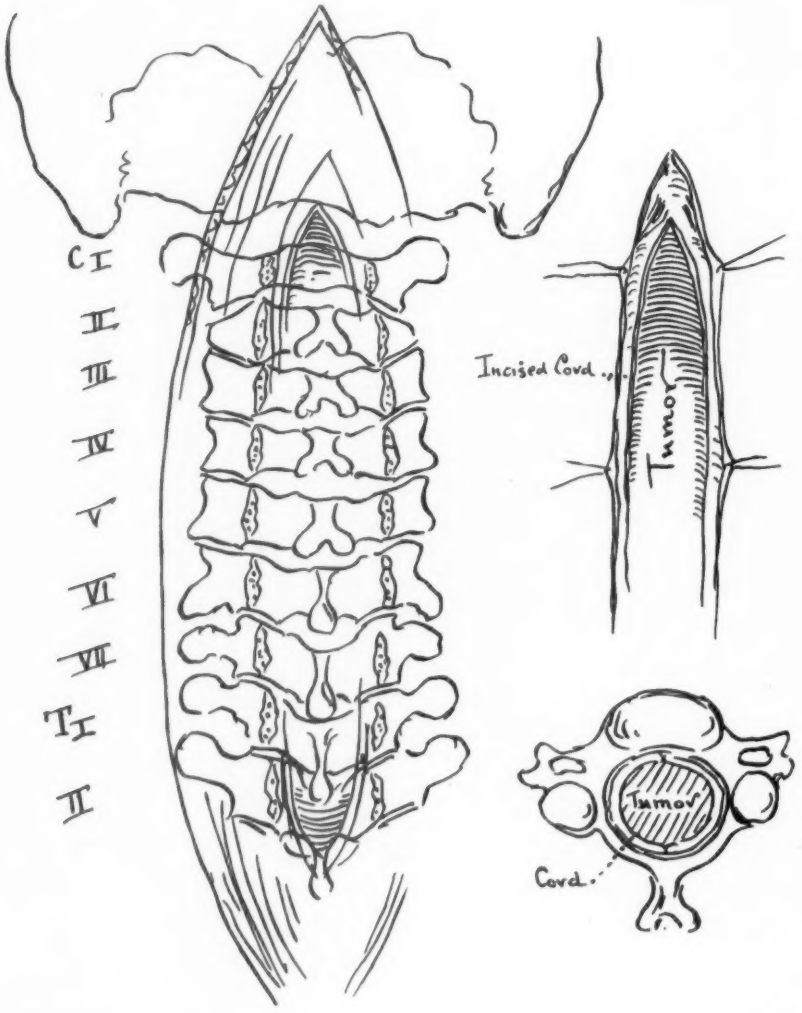

Fig. 15 (case 9).—Postoperative sketch to serve as a reminder of the exposure and what was found at the first operation.

An extraordinary condition was found. The canal, as shown in the operative sketches (fig. 15) was greatly distended, so that the flattened laminae were removed easily, giving an unusually wide exposure. When the dura was opened and reflected. No fluid was secured, and a bulging cord presented. One could see through the thinned nervous tissue that there was a central tumor.

A longitudinal incision, the length of the entire wound, through the greatly thinned posterior columns, disclosed a central soft reddish tumor mass which began spontaneously to extrude itself. With a "sucker," it was cleanly removed, leaving a widely dilated, thinned out gutter of nervous tissue.

I can only liken the procedure to the splitting of the skin of an over-ripe banana with the removal by suction of its central fruit, leaving the collapsed skin behind. The upper pole of the tumor was at the level of the foramen magnum, and not until this portion of the growth was removed did cerebrospinal fluid begin to find its way down into the gutter. The lower pole of the tumor extended below the second thoracic level, and it was thought wise to postpone further measures for a second session.

The tumor, which presumably extends much further down in the cord, proves to be an ependymoma and has therefore arisen from the central canal. Now that she has made such an excellent recovery (fig. 16) we propose to laminectomize the remainder of the spine and to clean out what remains of the lesion

Fig. 16 (case 9).—Appearance of child showing vast improvement after removal of large intraspinal glioma extending from foramen magnum to mid-thoracic region. The extent of the successive laminectomies is shown on the right.

in the lower levels, for it fortunately is a relatively benign type of glioma and is not infiltrative in character.

Subsequent Note.—The second laminectomy exposing the remainder of the cord from the second thoracic to the second lumbar vertebrae inclusive (as shown in fig. 16, back view) was carried out on November 2. When the cord was exposed I found to my surprise that the tumor ended at about the second thoracic level with nothing below but a marked hydromyelia. The patient was discharged on November 27, walking, with free cervical movements, return of function in her hands, and little to show for her former trouble except overactive reflexes.

CASE 10 [A boy walks in].—We now come to the last of the house cases. Fred Tolland is about 12 years old and was operated on more than a year ago for one of the malignant midcerebellar medulloblastomas arising from the roof of the fourth ventricle—the same kind of tumor that was found in Joseph Wilcox (case 6)

whom you have already seen. After being free from symptoms for more than a year, he has just been sent into the hospital again because of some intercostal pain.

A year ago last June, when he was first here, he gave a history of periodic bilious attacks for the preceding five years or more, with headaches, vomiting and malaise. He had had some suppurating glands of the neck which were supposedly tuberculous. You can plainly see the scars. For five weeks before admission, there had been some blurring of vision with diplopia. For possibly the same length of time he had been conscious of some unsteadiness of gait.

On physical examination there was little more to be seen than a frail boy having severe headaches and preferring to keep to his bed. He had a choked disk of 3 diopters, fine nystagmus, a positive Romberg sign with a tendency to fall backward, and staggering gait. The roentgen ray showed a slight hydrocephalus. The presumptive diagnosis was a cerebellar tuberculoma.

At the operation on May 27, 1925, sixteen months ago, a large tumor was exposed by an incision through the right hemisphere. The growth projected down into the spinal canal, necessitating the removal of the laminae of the atlas.

Fig. 17 (case 10).—The two chief portions of the lateral medulloblastoma removed at operation.

An attempt was made to remove the growth in its entirety; two large fragments (fig. 17), weighing 31 Gm., were separately dislodged, and so far as could be told the remainder of the soft lesion was sucked out. In this process the nerves and vertebral artery on the right were widely exposed, the medulla having been found dislocated far to the left. Owing to its unusual lateral situation a medulloblastoma was not suspected. The postoperative sketches (fig. 18) give an idea of the appearance before and after the enucleation.

He made an excellent recovery, and had a subsequent series of deep roentgen-ray treatments. The growth proved histologically to be a medulloblastoma.

He reported here last December and was found to be absolutely free from symptoms. His father stated that he had been perfectly well: playing football, skating, going to school like other boys of his age; never any headaches or trouble with vision.

A few days ago he was sent down to us because of pain in his chest, increased by deep breathing or coughing. He has reentered the hospital for study.

There is no indication of a local recurrence of the primary cerebellar lesion, but he almost certainly has a spinal metastasis which may mean that a laminectomy is in store for him. Up to this time he has done far better than could have been expected from a medulloblastoma in this situation.

Subsequent Note.—Under deep roentgen-ray therapy he made a marked temporary improvement and was discharged without operation. He continues (March, 1927) to do well, but the ultimate prognosis is grave as in all gliomas of this type.

These, then, are the nine children who now happen to be in the hospital with presumed tumors or with tumors already disclosed by operation. You will have observed that in five of the six cases in which the lesion has so far been verified it was in the cerebellum; that in five of the six

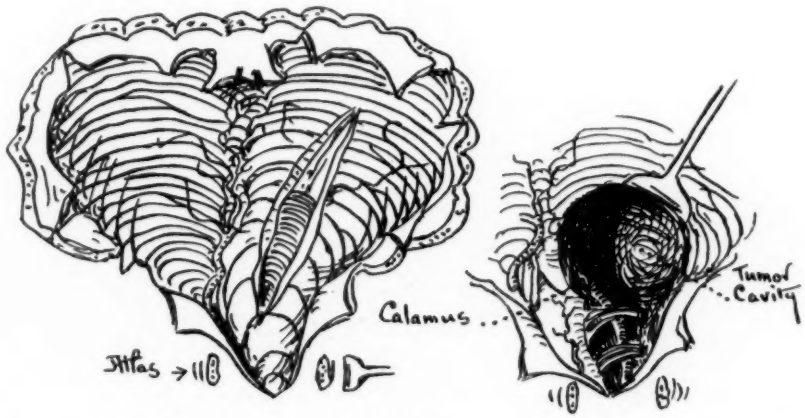

Fig. 18 (case 10).—Postoperative sketches roughly indicating the site of the incision through the bulging right hemisphere, and the appearance of the brain stem and pocket after the extirpation.

cases it was a glioma, and that in two of the children awaiting operation we suspect the same lesion. Not wishing to leave you with an impression of the ultimate hopelessness of these conditions, even though most of the children are at the present time apparently doing well and free from symptoms, I have sent out a number of letters to some of our former patients who reside in the neighborhood, so that we may make some comparisons.

PATIENTS REPORTING

If you will refer to the last column in table 3 while these additional patients are being briefly shown you will observe, provided the lesion was a glioma, that it was of the type which appears at the lower part of the list. This accounts, in most cases, for the fact that these children are here at all. One thing that will distress you, as it distresses me, is that

four of them are nearly or totally blind. They have been brought in from the Perkins Institute for the Blind where they are now at school. An earlier diagnosis of their malady would have spared them loss of vision, and this perhaps is the most important lesson to be drawn from this clinic. We may see these four children first.

CASE 11 [Patient led in].—Bertrand Chambeau, who is now 14 years old, is an example of recovery from a cerebellar tuberculoma. He was admitted here just six years ago, in the autumn of 1920, with a fullblown cerebellar syndrome. He had been having headache and vomiting for four months, followed by rapid failing of vision. He had become totally blind from secondary optic atrophy three months before admission. A sorry story was told of his having become separated from his parents during the evacuation of Lille before it was occupied by the Germans. He was in poor nutritional condition.

At operation on Sept. 14, 1920, what was taken for a solitary tubercle was exposed in the right cerebellar hemisphere. The cerebrospinal fluid from the ventricle was injected into a guinea-pig, which died of a form of peritonitis apparently nontuberculous. The child also had, at the time, some hematuria, and the roentgenogram of the chest showed an increased density at the root of each lung. The diagnosis of a tuberculoma therefore may be almost certain, though the lesion was not histologically verified.

This is the longest example of a recovery of a surgically identified tuberculoma in the hospital records, and shows at least what a decompression in these cases may do under favorable circumstances. The boy has been getting his schooling at the Perkins Institute where he has been for the past three years.

The case is of interest in connection with that of the little boy, Peter Moran, whom you have just seen (case 8).

The next four patients all had partly cystic cerebellar astrocytomas (either fibrillary or protoplasmic) comparable in all respects to the lesion encountered in the Calarco boy (case 5). I will present them in the chronological order of their hospital admission. It will serve to show how we have advanced in our knowledge of these conditions.

CASE 12 [Walks in].—My longtime friend and patient, Milton Ferguson, is now 29 years old, and I have been following his case for twenty years. This, I fear, speaks more in his favor than mine, for he has been an optimist while I have only been persistent.

He first came under my care at the Johns Hopkins Hospital in March of 1907 when I knew comparatively little about cerebellar tumors. He was then a boy of 9 with an advanced cerebellar syndrome and, what is more, was nearly blind. A suboccipital decompression was performed without disclosing a tumor; and we would hardly have known in those days what to do with it had one been exposed.

He did well for a year, when there was a return of symptoms. So in June, 1908, he was operated on for a second time, and a cyst was found and evacuated. For the next four years he was at the Perkins Institute, where he made rapid progress in his studies and remained in excellent health.

In June, 1913, symptoms had again begun to return, but it was not until the next February (1914) that he was operated on a third time, when the cyst was reopened and some of the solid tumor in its wall removed.

Three years later (1917) during my absence abroad, because of a return of symptoms he had a fourth session at the hands of another surgeon who exposed and partly removed the growth. I had to intervene again in April, 1919. A more radical procedure was undertaken in two sessions with extensive

removal of solid portions of the tumor and fixation of the wall of the cyst with formalin solution. He did extremely well for six years, remained reasonably free from symptoms, got some employment and was able partly to support himself.

In 1925, owing to a definite return of his headaches and unsteadiness, he was operated on for the sixth time, when a great central mass of recurrent tumor was removed. The tissue at this time had become fibrous and partly calcareous.

He has since done extremely well, and though there is little of his cerebellum left he walks as you see with less incoordination than one would expect. Fortunately, he has enough vision at least to let him get about alone without running into objects.

It is quite probable that, if we could have known in 1907 what we know today about these tumors, he might have got off with a single operation; but a "glioma" in those days sounded like a hopeless lesion even had our surgical experience enabled us to find it and to go about its removal. Long standing cases of this kind are the ones that have forced on us the need of a classification of the gliomas into favorable and unfavorable types.

It was not until the last operation in his case that we verified the tumor histologically as a cystic fibrillary astrocytoma and actually knew with what we were dealing.

CASE 13 [Led in].—Mary Shea was also operated on many years ago for a cystic fibrillary astrocytoma of the cerebellum. She is now 22 years old. She entered this hospital on June 2, 1913, when 9 years of age, with a history of headaches and vomiting coming on in attacks during the preceding year. For four months she had had failing vision with periods of complete amaurosis. She had become a little unsteady on her feet; this was ascribed to her loss of vision. She had been treated in a hospital for "stomach trouble."

Physical examination showed a child practically blind from secondary optic atrophy. She had an enlarged head due to hydrocephalus, static ataxia, and loss of bladder control. There was no nystagmus.

On June 5, 1913, a large, partly cystic median glioma was enucleated with a good deal of bleeding, and a transfusion was performed with the father's blood. She made an excellent recovery and fortunately has retained sufficient vision to enable her to distinguish light from dark. She is a pupil at the Perkins Institute and except for her near-blindness has remained all these years in normal health.

CASE 14 [Child led in].—Gloria Maffini was operated on two years ago, when 3 years of age, also for a cerebellar astrocytoma. She was transferred here from the Children's Hospital on Oct. 8, 1924. Her parents were intelligent Italian people, who stated that she had had a normal childhood and could walk at 11 months. Some three months before admission they had first noticed that she was cross-eyed. In a week or two she began to have bouts of vomiting and soon showed some disability in gait which increased until she was unable to walk alone. The mother noticed also a rapid increase in the size of her head.

Examination showed an evident hydrocephalus, confirmed by the roentgen-ray, and a bilateral choked disk with marked secondary atrophy. She had a left internal squint, and there was marked incoordination of the arms and legs of cerebellar type but with a practical absence of nystagmus. She was unable to stand alone. There was a bilateral ankle clonus.

At operation, on Oct. 17, 1924, a large midline, partly cystic tumor of the cerebellum, similar to that encountered in the Calarco boy (fig. 7) was dis-

closed and largely removed, laying bare a widely dilated fourth ventricle. Fearing damage to the nuclei, I left a fragment of tumor *in situ* in the region of the calamus.

The child had a postoperative accumulation of cerebrospinal fluid under the scalp from an imperfect muscle closure. In order to repair this defect the wound was reopened on December 3. At this time the cerebellum was reexposed and the remaining nodule of tumor, which had become partly dislodged and lay clearly in view, was removed, so far as could be told, in its totality. The growth proved to be a protoplasmic astrocytoma.

The child, as you see, has made a complete recovery. She is quite free from symptoms, is intelligent and growing normally. The one misfortune in the case is that her vision had become so greatly impaired that she is barely able to count fingers.

CASE 15 [Walks in carrying a bouquet].—This is Evelyn Bloom, who lives up to her name. She also had one of these favorable tumors, but I deserve the flowers less than the physician who got her here early enough to save vision. She was a patient in the hospital more than three years ago, when she was 7 years old. She gave a history of having had attacks of vomiting for a period of about three months. Because of these attacks she often had to be sent home from school, and her mother was instructed to physic her. Numerous doctors saw the child in consultation, and she was examined in some of our local hospitals. An eye specialist fitted her with glasses. She was treated for gastric trouble. Finally, a roentgenogram was taken which showed definite hydrocephalic changes, and she was sent here from the Children's Hospital.

Examination disclosed a high choked disk, fortunately without formation of new tissue. Cerebellar signs were unmistakable. She had stiffness of the neck with suboccipital pain and tenderness; extreme nystagmus in all directions; unsteadiness of gait with marked hypotonia in both arms and legs. One curious feature of the case was that she would get into the knee-chest position and could with difficulty be persuaded to change it.

On July 7, 1923, a suboccipital operation disclosed a large cystic midline tumor which was largely removed. The elongated and widened floor of the fourth ventricle was laid bare as in many of the other cases. A fragment of the tumor on the left side was of necessity left behind. Normal vision was fortunately retained, and she continues to be in perfect physical condition now three years and four months since the operation. She has done extremely well and, as you can see, is much more self-possessed than I am before this audience.

CASE 16 [Walks in].—This boy, Gerard Doucette, had a tumor of another sort though in the same midcerebellar situation. It happened to be a particularly characteristic ependymoma which has been much studied and the case was reported by Dr. Bailey[5] a year after his operation.

His symptoms had been of eight months' duration and were typically cerebellar in nature, with headaches, stiffness of the neck, vomiting and so on. He first reported at the Medical Out-Patient Department of the Children's Hospital; roentgenograms of the cervical spine were taken and some carious teeth were removed. A presumptive diagnosis was made of hysteria. He was sent to Wellesley where he remained two months and was discharged to the Psychopathic Hospital, where a diagnosis of congenital psychopathic inferiority was recorded. A month before admission here he was seen by an ophthalmologist who said he had weak eyes and prescribed glasses.

Finaly his eyes became crossed, and muscular weakness with incoordination became so marked that he was confined to bed. His chief complaint was of

5. Bailey, P.: A Study of Tumors Arising from the Ependymal Cells, Arch. Neurol. & Psychiat. **11**:1 (Jan.) 1924, case 4.

suboccipital pain which was increased by any motion. He was seen in consultation by Dr. Horrax at the Children's Hospital and was transferred here for operation. By this time he showed a fullblown cerebellar tumor syndrome with advanced choked disk.

On Jan. 17, 1923, he was operated on by Dr. Horrax, and a large midcerebellar tumor was disclosed projecting into the spinal canal. It was necessary to remove the arch of the atlas to bring its lower end into view and to give a generous decompression. Only a few fragments of the tumor were removed for histologic study. He made a rapid recovery, was given subsequent roentgen-ray treatments and has remained so far perfectly well. He is absolutely free from any symptoms, and it is difficult to believe he can be harboring such a tumor. Fortunately he has retained his eyesight.

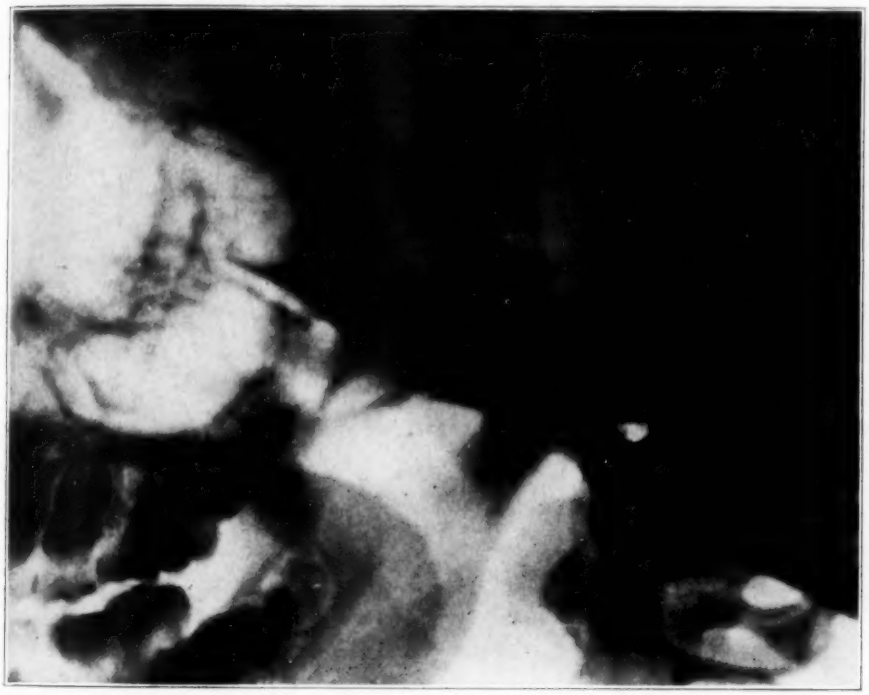

Fig. 19 (case 17).—Sella of child of 10 with infantilism due to chromophobe adenoma rather than the anticipated congenital tumor.

Lest you may have come to feel that all the tumors in children are cerebellar I will show, in closing, two other patients of quite a different sort. The first of them is the single example in our whole series of preadolescent hypopituitarism caused by a pituitary adenoma. The condition is most rare. The child was over-well nourished and undersized, with primary optic atrophy and bitemporal hemianopia. This syndrome is commonly produced by a craniopharyngeal-pouch cyst. The roentgenogram, however, disclosed this greatly ballooned sella (fig. 19) with no evidence of calcification, such as you saw, for example, in one of the

cases already presented (fig. 6). We nevertheless expected to find one of these more common lesions and were quite unprepared for the adenoma that the operation disclosed.

CASE 17 [Child walks in].—Evelyn Driscoll at the time of her admission two years ago was 10 years of age. She had always been a good student at school, until six months before admission when she had severe headaches associated with vomiting and nausea. She had been to see many physicians and had been to a number of local outpatient clinics without getting any relief. She was finally referred here from the ophthalmologic department of the City Hospital where her optic atrophy was discovered. She had a metabolism of —27.

Fig. 20 (case 18).—Solid tumor (astroblastoma) removed at a second session from what had been the wall of a large cyst in the right cerebral hemisphere.

On Dec. 19, 1924, a transfrontal exploration was made. To my astonishment, instead of the expected congenital tumor, I found as stated, a large adenoma which had not as yet burst through the bulging capsule. The adenoma was as thoroughly scooped out as circumstances permitted. There was immediate relief from headaches and marked improvement in vision, which at the time of discharge was normal.

She has not been seen since that time until today. Dr. Horrax has taken her fields and finds them normal in the right eye, which formerly was most seriously affected. The left eye shows a hemianopia. She has grown 3 inches (7.6 cm.) during the past year, so that the gland is still functioning, even though there is evidently a recurrence (or continuance) of the growth. Just what course we should now take I am not quite prepared to say.

George Petherick, the last of these old patients to answer our request to come here today, had a verified cerebral astroblastoma—rather a rare tumor. Three years ago, before operation, he was shown at a clinic in this room and his case has already been reported.[6] I am glad to show him again today because he has made an apparently perfect recovery, though it took three successive operations to accomplish it.

CASE 18 [Boy walks in].—At the time of his admission on May 19, 1923, he was 6 years of age. He gave a history of having been sent home from school only a month previously because of a bad frontal headache and vomiting. Soon some weakness of the left arm, face and leg was observed. He became progressively worse; there were oculomotor palsies and a rapid failure of vision. He was sent here as an urgent case on the advice of Dr. Harry Goodall, who had seen him the day before in a Framingham hospital. The boy had a high grade of choked disk with most peculiar oculomotor palsies, which made us suspect a tumor of the midbrain. His condition precluded the use of perimetry. To determine whether there was hydrocephalus or tumor in the right hemisphere, a puncture was made on June 4, which entered a huge gliomatous cyst from which 100 cc. of xanthochromic fluid was withdrawn.

On June 7, an osteoplastic cranial resection was made; the cyst was opened, a mural nodule of tumor was removed, and the cyst walls fixed with formalin solution. He did well for a few weeks, but as his flap continued to ride I feared that the cyst had refilled, and consequently on July 16, the flap was reelevated and the situation of the cyst was found, to my amazement, to be occupied by this 144 Gm. tumor (fig. 20). It is astonishing that so large a mural tumor could have escaped notice. No trace of the previous cystic cavity was found. It was not difficult to brush the brain away from the growth and to remove it intact.

The child has made, as you see, a perfect recovery except for some continued weakness with astereognosis in his left hand—a trifle to pay for his escape from a more serious condition. His vision fortunately has been preserved. The tumor is a peculiar form of glioma which we at first were unable to classify satisfactorily, but which Dr. Bailey now regards as an astroblastoma.

SUMMARY

In résumé there are a few things that I may reemphasize. You will have observed that most of these children had cerebellar tumors; that most of them had enlarged heads giving Macewen's sign on percussion; and, what is more, that the enlargement of the head was commonly followed by a cessation of headache with a subjective freedom from discomforts which was misleading to parents as well as to physicians. However, in several of the cases, by the time this subjective improvement occurred, vision had begun to fail and had not infrequently been lost before the seriousness of the child's malady was appreciated.

You will have observed, too, that these patients (like one of the little girls [case 3] awaiting operation) may often appear to be so well, in spite of their bouts of vomiting, that the advanced grade of choked disk may come as a total surprise; for children are not as prone as adults to complain of a slight obscuration of vision. Vomiting, as may be

6. Cushing, Harvey: Series of Intracranial Tumors and Conditions Simulating Them, Arch. Neurol. & Psychiat. **10**:605 (Dec.) 1923, case 12.

again pointed out, is apt to be the dominating feature of these cases at the outset, and indeed may be regarded as a symptom of localizing value.

Out of this chance group of eighteen cases, new and old, eleven children have been shown to have had tumors of the cerebellum, and the two awaiting operation probably also have subtentorial lesions. Two other children had large cerebral tumors, fortunately of a favorable type. Another had a pituitary adenoma, and still another a tumor of the spinal cord. In this small series, therefore, the proportion of verified subtentorial to supratentorial tumors is as 11 to 4, which slightly exceeds the usual proportion, for according to table 2 it should be as 9.5 to 4.8.

As it happens, a number of tumors with unusual pathologic changes have been included. The two cerebral tumors, though they doubtless belong in the group of gliomas, are to all gross appearances benign lesions. A pituitary adenoma in a child is exceedingly rare. It moreover is unusual to meet with two tuberculomas and one of the rare blood-vessel tumors (peritheliomas) in so small a group of cases, though, to be sure, the lesions in these three cases have not been histologically verified.

Of the eleven cerebellar tumors, the majority have been median gliomas of one variety or another which have taken their origin from the roof of the fourth ventricle. Seven of these tumors have been ones with an excellent prognosis: five astrocytomas, one of them with a survival period of nearly twenty years, an ependymoma, and a perithelioma.

I may say, in closing, that a median tumor of the cerebellum is so common a lesion in preadolescence that when a child has unexplained vomiting, shows a possible enlargement of its head and gives a story of periodical unsteadiness, it is well to be on guard and to have a look at the eyegrounds every week or two.

CONGENITAL ATRESIA OF THE FORAMEN OVALE

REPORT OF A CASE, CLASSIFICATION AND COMMENT ON FUNCTION *

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Normally, the foramen ovale ceases to function after the establishment of respiration, and is actually closed by adhesions at about the tenth day after birth. However, a widely patent foramen is a fairly common congenital lesion, and about 30 per cent of all adult hearts permit the passage of a probe between the two auricles. Distinctly pathologic and extremely rare is the intra-uterine occlusion of the foramen ovale.

A few authentic cases have been described by reliable observers. Vieussens [1] recorded the first case in 1715; since then Smith,[2] Vernon,[3] Tait [4] and Osler [5] have each reported a case. The first three of the foregoing cases were assembled by Peacock [6] in 1858 in his monograph on congenital cardiac disease. Most other authors have omitted discussion of this lesion or dismissed it with but few words. Because of its rarity, therefore, the following case is reported:

History.—A boy, weighing 3.6 Kg., seemed normal following an easy delivery. The respirations were prompt and the cry was vigorous. Soon, however, cyanosis was noted which became more intense just before death at the end of thirty-two hours.

Necropsy.—No trace of the foramen ovale could be found on either side of the auricular septum. The right side of the heart was abnormally large and well developed; the left side, except for a long tubular auricular appendage, was surprisingly small in capacity but had a relatively thick myocardium. The entire apex was occupied by the right ventricle, whereas the left ventricle extended about half way to this point. The endocardium of the latter was thick and opaque and its surface area was only 2.8 sq. cm. The mitral, tricuspid and pulmonary valves were normal, but the aortic valve was malformed so that its segments were

* Received for publication, Oct. 30, 1926.

*From the pediatric service of Dr. Herman Schwarz, John E. Berwind Maternity Clinic.

1. Vieussens, R.: Traité de la structure du cœur, ed. 1, Toulouse, J. Guillemette, 1715, p. 35.

2. Smith, E.: Premature Occlusion of the Foramen Ovale, Tr. Path. Soc. London **1**:25, 1846-1847.

3. Vernon, H. H.: Two Cases of Malformation of the Heart, Tr. Med.-Chir. London **39**:297, 1856.

4. Tiat, L.: A Case of General Dropsy in a Fetus, Tr. Obst. Soc. London **17**:307, 1876.

5. Osler, W.: Cases of Cardiac Abnormalities, Montreal Gen. Hosp. Rep. **1**:177, 1880.

6. Peacock, T. B.: Malformations of the Heart, ed. 1, London, John Churchill, 1858, p. 73.

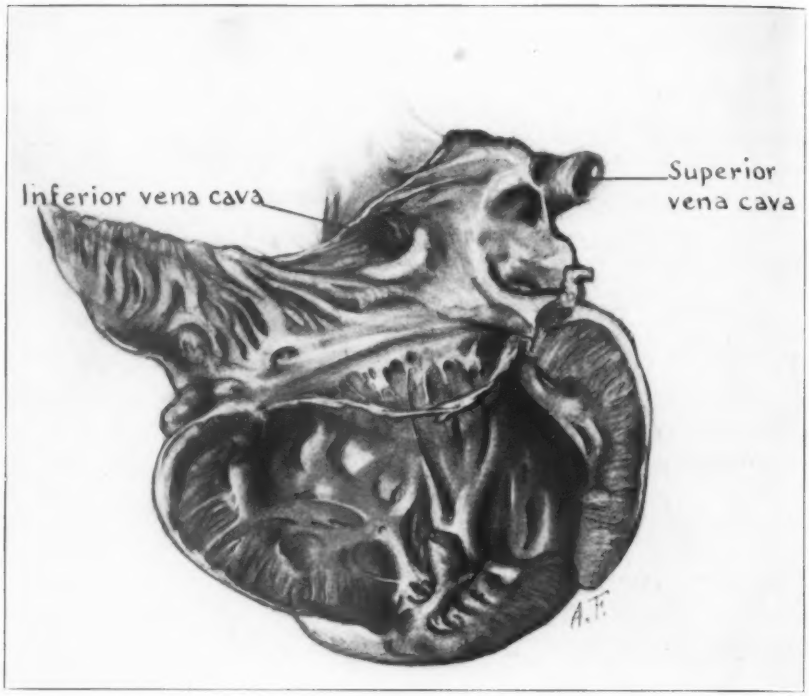

Fig. 1.—Well developed right auricle and ventricle; no trace of a foramen ovale (normally in interauricular septum near orifice of inferior vena cava).

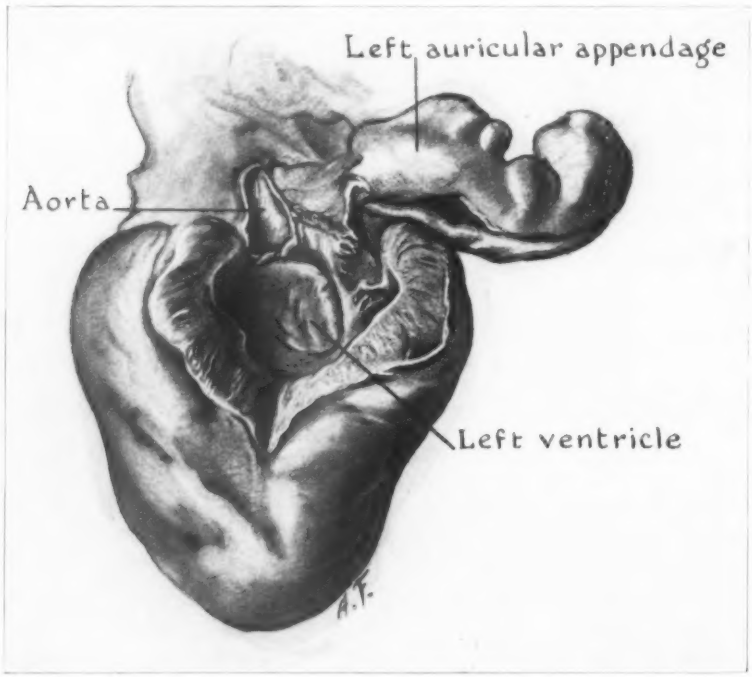

Fig. 2.—Diminutive left ventricle extending only half way to apex (compare with fig. 1, same scale); thick myocardium; long tubular auricular appendage.

indistinguishable. The caliber of the pulmonary artery and the aorta as far as the isthmus showed a disparity proportionate to the size of the chambers from which they arose. A large ductus arteriosus seemed to continue the pulmonary artery into the descending aorta. The coronary arteries and the great branches from the arch of the aorta arose normally. The lungs had patches of emphysema; the spleen was moderately enlarged and of a firm, rubberlike consistency, and the kidneys contained uric acid infarcts. Otherwise, the organs were essentially normal.

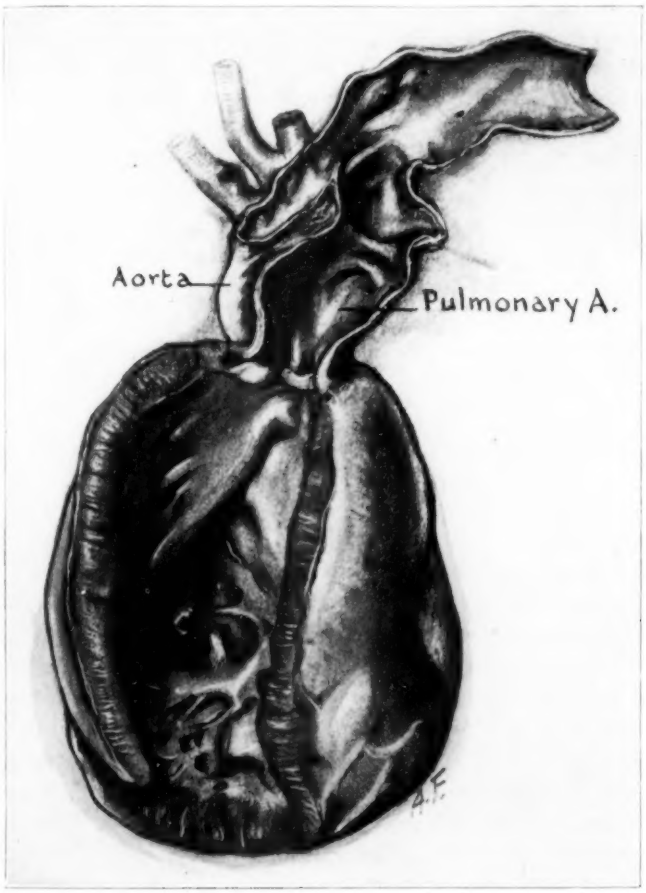

Fig. 3.—Aorta as far as isthmus considerably narrower than pulmonary artery.

CLASSIFICATION

Although only a few cases of this condition have been reported, they may be described both clinically and anatomically in definite groups: (1) infants with marked edema at birth, (2) infants apparently normal at birth but dying with cyanosis within a few days and (3) atypical cases modified by other major cardiac anomalies.

Two almost identical cases belong to the first group. Tait [4] delivered a seventh month fetus with the heart beating at birth, but with weak

respirations which were never successfully established; Osler [5] reported his necropsy observations on an eighth month still-born infant. Both infants had extreme anasarca which also involved the cord and placenta. In both, an adult type of fossa ovalis almost completely occluded by a thin membrane was found. Each heart showed large right chambers, small left chambers and a large ductus arteriosus.

The second group includes the cases reported by Vieussens,[1] Smith [2] and me. The infants lived for 30, 21 and 32 hours, respectively. All appeared normal at birth, but cyanosis soon developed. In Vieussens' patient and in mine there was no trace of a foramen ovale, but in Smith's patient it was closed completely by a reticulated membrane bulging through into the left auricle. All showed the characteristic disproportion of the right and left side of the heart, and each had a large ductus arteriosus. Both Smith and I noted a large left auricular appendage and a thick left ventricular endocardium. Defects of the mitral valve in Smith's case and of the aortic valve in mine were observed. Vieussens recorded dilated pulmonary vessels, pulmonary edema and a quantity of fluid in the pleural cavities.

In the third group may be placed Vernon's [3] case; the infant lived for four and one-half hours and had marked cyanosis. The foramen ovale was obliterated and the right cavities of the heart were much larger than the left. However, there was a large defect in the upper part of the septum ventriculorum which caused the aorta to arise from both ventricles, and there was no ductus arteriosus.

A different classification of the preceding cases might be based on the mechanism by which the impervious interauricular septum was produced. The discovery of an adult type of fossa ovalis within a few hours after birth, as in Smith's, Osler's and Tait's cases, must be interpreted as due to an intra-uterine closure. Peacock states that this occurs during the later periods of fetal life. The failure to find any trace of a foramen ovale, as in Vieussens' case and in mine, is probably due to an error in the development of the auricular septum, with no formation of this aperture.

COMMENT

From these cases the chief function of the foramen ovale may be inferred. With it open there is a proper division of the incoming venous blood between the two sides of the heart, and a consequent proportionate development of both sides. If it closes before birth, all the venous blood goes to the right side of the heart, while only the negligible quantity of blood from the fetal pulmonary circuit goes to the left side. As a result of this overload on one side, decompensation with general anasarca may result, or the two sides may become adjusted to their respective tasks. The one then undergoes dilatation and hypertrophy; the other, contracture of its chambers but no atrophy of its muscle, as it still must pump against the pressure in the great vessels.

Such a condition, with the fetal circulation maintained almost exclusively by the right side of the heart via the ductus arteriosus, is not so serious a handicap while the site of oxygenation is the placenta. With the transfer of this function to the lungs following birth, only venous blood from the body can be pumped by the right side of the heart, and all oxygenated blood from the lungs must be pumped by the left side of the heart. With its small capacity, however, only a relatively small output of oxygenated blood is possible and a fatal anoxemia may result.

Whether survival ever occurs with some degree of readjustment of the two sides of the heart to their respective tasks demanded by postnatal conditions is purely speculative. If there have been such cases, they constitute a group not included in the classification. However, the difficulty of recognizing a premature closure of the foramen ovale at a necropsy later than the neonatal period is obvious.

247 West Ninety-Ninth Street.

NEUROCYTOMA OF THE LEFT SUPRARENAL GLAND

WITH METASTASES TO THE LIVER, SKULL AND BONES

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AND
THOMAS C. KELLY, M.D.
PHILADELPHIA

Robert Hutchison [1] of London, in 1907, was the first to draw attention to what he called "suprarenal sarcoma in children with metastases in the skull." He reported ten cases, the clinical and pathologic features of which closely resembled one another.

Hutchison outlined his group of cases as follows: "In the majority of cases the first thing noticed was some swelling about the bones of the skull, which in several of them was ascribed to a fall or an injury. Following, or sometimes preceding this, proptosis of one or both eyes was observed. In two thirds of the cases, discoloration of the eyelids on one or both sides was reported and in a few instances this was the first thing to attract attention. Anemia was a striking feature in all the cases. Leukocytosis was not reported in any case. An abdominal tumor in one or the other loin was felt in only five cases. The progress of the disease in every instance was rapid. The duration of life in the oldest child was about six months and in the youngest of the series only one month.

"The postmortem findings were also very constant. In all, there was found a sarcoma of the suprarenal, usually consisting of small round cells, situated on the left side in six cases and on the right side in four cases. The most extensive metastases were found in the bones of the vault and base of the skull. Metastases were also met with in the ribs, sternum, and vertebrae and in one case in the long bones. Secondary deposits in the internal organs appeared to be exceptional. The adjoining kidney was sometimes involved, but rather by direct extension than by metastasis. The liver was similarly involved in some cases where the tumor started in the right suprarenal. In none of the cases was there any indication of premature sexual development as has been described as a consequence of malignant hypernephromata in childhood."

It is extremely interesting to see how closely the case reported here follows Hutchison's original description. Our case also bears out the contention of Boyd [2] that when the primary tumor is in the left suprarenal, the left eye will show ecchymosis before the right eye.

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1. Hutchison, Robert: On Suprarenal Sarcoma in Children with Metastases in the Skull, Quart. J. Med., 1907.
2. Boyd, William: Surgical Pathology, 1925.

REPORT OF CASE

History.—On June 24, 1924, an Italian girl, aged 5 years, who complained of pain in the head, neck and right hip, was admitted to the medical wards of St. Christopher's Hospital for Children in Philadelphia. The pains had been of four months' duration and were accompanied by night cries and loss of weight. She had been confined to bed for three weeks.

On admission, the temperature was 102, pulse, 150 and respiration, 28. She was emaciated, with some pallor of the visible mucous membranes and skin

1. Neurocytoma of the suprarenal, showing effect of metastases to orbits.

but without jaundice, cyanosis or edema. The head was normal in shape and size; the eyes were without exophthalmia, and vision apparently was good; the pupils reacted to light and accommodation; there was no discharge from the ears and hearing was good. The tonsils were enlarged, swollen and red. The lungs and heart were normal. The abdomen was not tender, and no masses were felt. The liver, spleen and kidneys were not palpable. The urine was normal. Examination of the blood showed: hemoglobin, 75 per cent; red blood cells, 2,500,000; white blood cells, 6,000, 60 per cent of which were polymorphonuclears and 40 per cent lymphocytes.

There was some pain on pressure over the right hip. Roentgenograms showed some rarefaction of the head of the femur but were otherwise negative. Von Pirquet and Wassermann tests were negative. Blood culture was sterile.

The tonsils were removed.

Week by week she became weaker and had more and more pain in the hips, knees, back and shoulder. The anemia increased. She could not move or be moved without evident pain. She sought for the most part a position on the side with the knees and hips half flexed. At times there was fever. The patellar reflexes were exaggerated on both sides. Roentgenograms of the spine were normal. Examination of the spinal fluid was negative.

Two months after admission an ecchymosis of the left upper eyelid developed, which persisted for several days. The nurses thought that the child must have hurt herself against the side of the bed. Then it was apparent that some exopthalmia was developing in both eyes. The ecchymosis returned but now was present in both upper eyelids, though that of the left eye was the most marked.

The vision and hearing became decidedly impaired. The legs became completely paralyzed, and she moved about in her bed by dragging the legs and moving them with the hands. There was a marked increase in the knee reflex, and a bilateral ankle clonus and a positive Babinski sign developed. Sensation and pain sense were undisturbed. There was no enlargement of the superficial lymph glands. There was no tenderness on pressure over the vertebrae. The abdomen was full, and the liver increased in size, but the spleen or kidneys could not be palpated definitely. Later, a few nodular masses could be felt on the palpable liver surface.

The child was conscious and in fact active mentally. She could not see, of course, but the senses of touch, taste and smell were not altered. About six months after admission, the hands, arms, ankles, feet and face became edematous. Signs of pulmonary congestion developed, and in a few days death ensued.

The most striking of the early signs was the ecchymosis of the upper eyelid followed by proptosis. This ecchymosis was of a peculiar greenish blue, which varied in intensity from day to day. In the earlier weeks, at times it seemed about to disappear. When particularly green, it suggested the possibility of chloroma, but the characteristic blood picture was lacking. The chief complain on admission was pain in the right hip. This was probably due to the metastatic growth in the right femur.

Ocular Examination (Dr. Frederick Krauss, ophthalmologist).—The ocular symptoms of disease were absent until September 18, when the pupils became dilated but remained active to light. The eyegrounds were normal. A few days later, a slight exophthalmos appeared. The pupils remained dilated but were sluggish to light. The edges of the disks were defined. The disks were off color and fluffy. The retinal vessels were normal in size. There were no hemorrhages.

The exophthalmos gradually increased, with hemorrhagic suffusions in the upper and lower lids. The eyeballs remained white and free from all hemorrhage in the conjunctival tract. The hemmorrhagic appearance was similar to that found in fracture of the base of the skull. As the exophthalmos increased, the limitation of motion in both eyes increased, but there was no lateral displacement of the eyeball; this showed that the exophthalmos was caused by a growth involving the whole of the orbit, equally on both sides.

Frequent recurrence of the hemorrhages took place, some of greater intensity, causing an almost black appearance of the eyelids. A small ecchymosis was noticed at the site of the attachment of the superior oblique of both eyes; otherwise the eyeballs remained free from hemorrhage.

By November 11, the exophthalmos was so great that the eyes could not be closed, and the eyeballs were immovable. The pupils remained dilated and immobile but the media was clear, with only a slight edema of the retina and a marked fulness of the veins. The optic disks showed beginning atrophy. The exposure of the eyeball caused intense edema of the conjunctiva. The swelling increased so greatly that, a week later, the eyeball was completely dislocated, with immense folds of conjunctiva which were thick and had a dry surface showing.

An opacity developed in the lower half of the cornea, not accompanied by any inflammatory symptoms. Gradually, the lower two-thirds of the cornea sloughed, with perforation and prolapsed iris, though ciliary congestion was

2. Cut section of the neurocytoma.

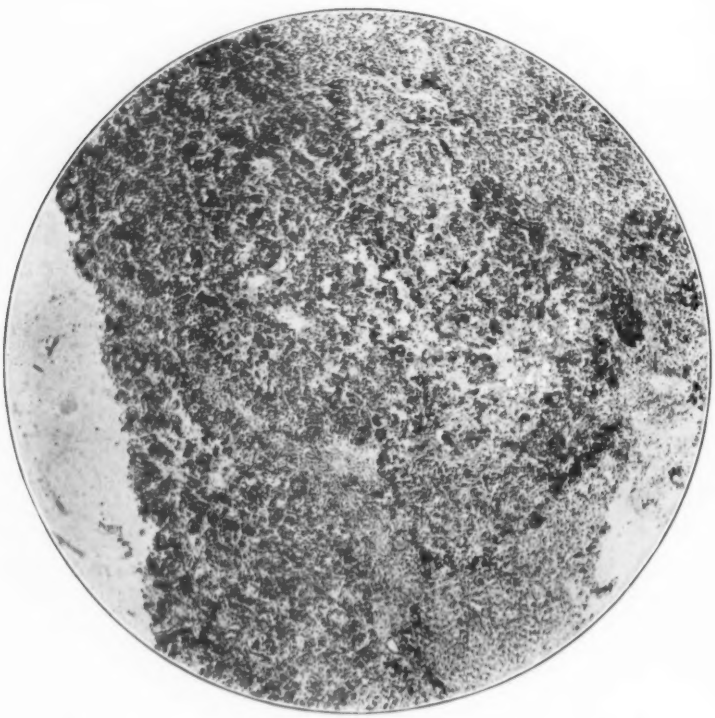
not apparent. On December 18, pus could be expressed from the remnants of the eyeball, showing that panophthalmitis had finished the destruction of the eyeballs.

Report of Autopsy (Dr. John Davis Paul, pathologist).—External examination showed only a peculiar bluish white, waxy skin almost suggestive of amyloid disease, together with a dark purplish discoloration of the skin around the eyes from the frontal to the malar eminences.

Behind the pleura and peritoneum, there was a large, dark reddish brown, soft fleshy mass extending from the fifth thoracic vertebrae down to the left kidney. This mass involved the fifth to the twelfth thoracic vertebrae, the left suprarenal and the upper third of the left kidney. The cut surface of the tumor was dark red, soft and spongy and exuded a large amount of blood. Metastatic

tumor masses were found in the bones of the skull, all of the ribs, the right os innominata and femur and the liver. The growths in the liver were lighter in color, slightly stained with bile, and were less vascular and a little more firm than the original tumor. Scattered through all of the growths involving the bones were myriads of small, needle-like spicules.

Of the metastatic growths, that involving the skull was probably the most interesting. When the scalp was removed thousands of irregularly circular, dark red areas, varying from 0.5 to 5 mm. in diameter, were seen. The sutures of the vault were sharply outlined in bright red. Immediately under each of the dark red areas, a small, sharp, dense spicule of bone projected into the



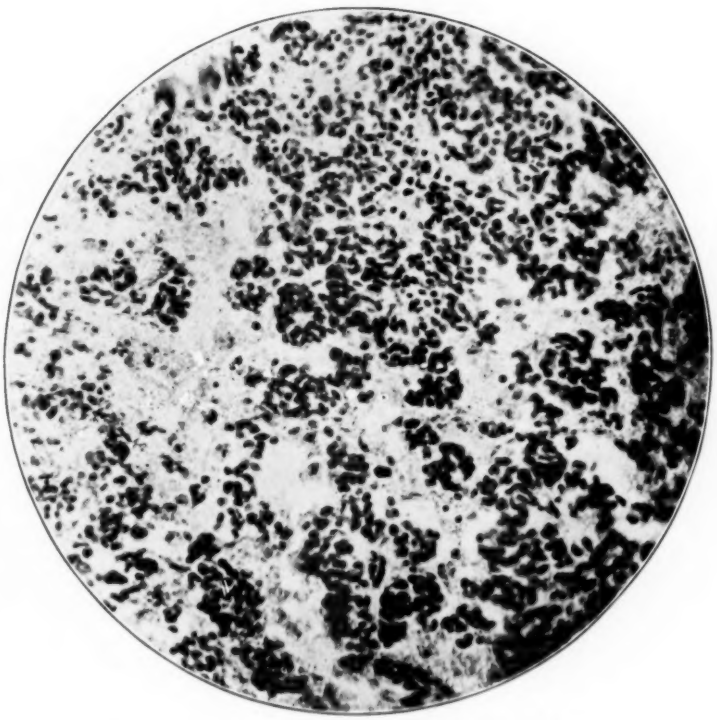
3. Low-power magnification of tumor of left suprarenal.

cavity of the skull, giving it the appearance of a nutmeg grater. The dura was thick, dull and lusterless, and was firmly adherent to the bone throughout the entire vault but had not been penetrated in any place by the bony spicules. The bones of the base had a moth-eaten appearance and were so soft that they were easily penetrated by the finger. The orbits were filled with masses identical with that involving the left suprarenal. The eyeballs were firm but shrunken, and were pushed forward by the tumor masses. The pupils were grayish yellow and opaque. The bones of the middle and posterior fossae were normal.

The brain and other organs were devoid of special pathologic change.

Microscopically, the primary tumor mass was made up of many rapidly multiplying, highly embryonic, undifferentiated small round cells in many of

which only the nuclei could be identified, the cell outline being poorly defined or entirely absent. Here and there were groups of larger, more clearly defined cells arranged in rosets. The matrix of the tumor and the center of the rosets were composed of a granular, eosin stained tissue. With Van Gieson's stain, the granular portion showed brown stained nerve fibrils arranged longitudinally; these bundles of nerve fibrils cut at right angles formed the center of the roset. In the metastatic growths they were much less numerous, and Van Gieson's stain failed to demonstrate the fibrils. These tumors could easily be mistaken for small, round cell sarcomas. When the metastases involved the bone, there were scattered portions showing cartilage and



4. High-power magnification of tumor, showing rosets.

embryonic bone formation. This new bone formation was probably due to the irritation of the periosteum by the foreign bodies of tumor cells and was not therefore an integral part of the tumor itself, which had its origin in the sympathetic nerve ends in the suprarenal.

The diagnosis was neurocytoma (Hutchison type) of the left suprarenal, with metastasis to the bones of the skull, ribs, thoracic vertebrae, the right os innominata, the right femur and the liver.

SUMMARY

1. A case is reported of neurocytoma of the left suprarenal gland with metastases to the skull, dura, ribs, vertebrae, right innominata, the right femur and the liver.

2. Tumors of the orbit with ecchymosis of the eyelids and proptosis in infants and young children should arouse the suspicion of metastases from a suprarenal growth.

3. Chloroma presents almost identical growths but can be excluded by the absence of the characteristic changes in the blood.

4. The scanty literature refers in some instances to left suprarenal tumors causing first metastasis to the left eye and right suprarenal tumors causing first metastasis to the right eye, indicating a lymphatic transmission rather than a transmission by the blood stream. The first involvement in this case was on the left side, the same side as the primary growth in the suprarenal.

NONTRAUMATIC DIAPHRAGMATIC HERNIA

REPORT OF A CASE IN A CHILD AGED FOUR YEARS *

JEROME S. LEOPOLD, M.D.

NEW YORK

According to Hedblom,[1] who has made a report on the study of nearly 400 cases of diaphragmatic hernia in which operation had been performed, there have been only six cases of nontraumatic diaphragmatic hernia observed in children under 5 years of age. Hedblom's report represents all the cases reported in the literature up to 1924. This condition, therefore, seems uncommon enough in children to make the publication of the following instance of interest.

CASE REPORT

History.—S. H., a white boy, aged 4 years, was brought to me with the complaint of abdominal discomfort after eating, constipation and loss of weight. These symptoms had been present for six weeks. There was no history of any injury. However, it appeared to the mother that the symptoms had developed following a fright from which the child had suffered. The birth of the patient had been normal, and he had been breast fed for eighteen months. At the age of 2 years he had whooping cough.

Physical Examination.—A fairly nourished child of medium development was seen. His weight was 30¼ pounds (13.6 Kg.). There was dulness to flatness at the left base posteriorly, with diminished to absent breath sounds, and a few râles were heard in this area. The heart was displaced slightly to the right side. The abdomen was soft; the spleen and liver were palpable. The results of the remainder of the physical examination were negative. As there had been no history of any respiratory disease to account for the signs in the lower part of the thorax, it was thought advisable to refer the patient to the hospital for further study and especially for a roentgen-ray examination of the chest.

Roentgen-Ray Examination (figs. 1, 2, 3, 4 and 5).—With and without barium solution, these roentgenograms showed distinctly that the condition was diaphragmatic hernia, and that the stomach and parts of the small and large intestines were in the left pleural cavity. It was also shown that the barium passed through the stomach and intestines without any site of obstruction.

Course in the Hospital.—As the patient's condition seemed excellent, and as it was clearly evident after various interviews with his mother that consent for operation would be difficult if not impossible to obtain, he was kept under observation at the hospital. During a period of four weeks his general condition improved remarkably. There was a gain in weight of 4¾ pounds (1.11 Kg.), and there was freedom from pain and discomfort. Constipation was also relieved.

At the end of this period, symptoms and signs of an acute gastric and intestinal obstruction suddenly developed. The child complained of intense abdominal pain and of nausea. The pain seemed to be paroxysmal. Examination showed that the abdomen was greatly distended. In the upper part of the abdomen, extending under the ribs, there was a markedly tympanitic distended mass which was evidently

* Received for publication, Oct. 30, 1926.

* From the A. Jacobi Division for Children of the Lenox Hill Hospital.

1. Hedblom, C. A.: Diaphragmatic Hernia, J. A. M. A. **85**:947 (Sept. 26) 1925.

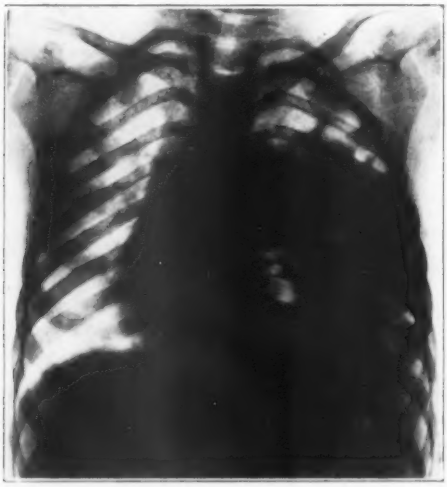


Fig. 1.—Examination of the chest before barium was given shows the heart to be pushed over slightly to the right side. The left lung and the left border of the heart are completely occluded by a dense shadow in which are seen globules of gas. These gas areas extend down below the level of the diaphragm and are rather suggestive of a diaphragmatic hernia.

Fig. 2.—Roentgenogram taken immediately after a barium meal shows that the stomach and small intestines and a portion of the colon are well up in the left side of the chest.

Fig. 3.—The stomach one-half hour after a barium meal.

Fig. 4.—The small bowel three and one-half hours after a barium meal.

the stomach. Visible peristalsis was present. Rectal examination was negative. An enema was given with little result. Dr. Franz Torek, who saw the patient in consultation, advised immediate operation. Signs of shock developed rapidly.

Operation (Dr. Torek).—Under gas-ether-oxygen anesthesia, a median epimesogastric incision was made. The region of the diaphragm was exposed, and it was seen that the mesentery of the small intestine was stretched upward and disappeared through the diaphragm. A portion of colon extended upward in the same manner into the thoracic cavity. Only a small portion of the stomach was found to be in the abdomen, the remainder of it being in the thoracic cavity. The colon was easily drawn downward and proved to be the ascending and part of the transverse colon. The cecum and appendix were clearly seen as they were drawn from the thoracic cavity. Next, a loop of small intestine followed, after which

Fig. 5.—A long loop of the colon well up in the left side of the chest. When distended with the barium clysma, it passes up nearly to the apex.

the entire small intestine was brought down out of the thoracic cavity into the abdominal cavity. The delivery of the small intestine was also easy until it was almost all out, but the uppermost portion, that is, the duodenum and a portion of the jejunum, gave resistance to traction. This was evidently due to the fact that the stomach would not readily come down out of the thoracic cavity. Traction on the small intestine was therefore stopped, and attempts were made to deliver the stomach, beginning at the cardiac end. The delivery of the stomach out of the thoracic cavity was difficult but was finally performed and an enormously distended stomach filled with fluid was seen. As the stomach entered the abdominal cavity the patient stopped breathing, and oxygen was forced into the mouth by the anesthetist, without any improvement in the condition, however. It seemed evident then that some of the fluid from the stomach had entered the mouth of the patient and had been aspirated, causing drowning. The patient was at once

placed in the Trendelenburg posture to allow the fluid to run from the bronchi. The pulse at the same time began to fail, the beats becoming very slow and faint just as though the patient were dying. With the finger in the diaphragmatic hernial opening, it was easy to feel the heart and the aorta, and to recognize the steadily weakening beat. Massage of the heart was then performed which caused no difficulty, as the entire heart was easily under the control of the fingers introduced through the hernial opening. After massage for about one-half minute, the heart beat became more normal, and within a minute was about as good as it had been before. The hernial opening was now examined, and was found to be an enlargement of the esophageal hiatus in a direction to the left and forward. It was about large enough for three fingers to enter. This opening was closed by four silk sutures, the introduction of which was somewhat difficult owing to the fact that the anterior border of it was partly concealed by the liver, which had to be drawn forward. The abdomen was now closed by through and through silk sutures.

To review the condition of this hernia: The hernial opening had its origin in the esophageal hiatus. The esophagus came through it in the normal way. The cardiac end of the stomach was normally in the abdomen, but the rest of the stomach, which represented about four-fifths of the whole stomach, had returned upward into the thoracic cavity and had carried with it the whole of the small intestine and a portion of the colon. The obstruction was due to the kinking of the stomach at the place at which it turned upward into the thoracic cavity.

The shock of the gastric and intestinal obstruction was severe, and the patient expired a few hours after the completion of the operation.

COMMENT

Among nearly 400 cases of diaphragmatic hernia reported by Hedblom, intestinal or gastric obstruction occurred in 33.3 per cent. The operative mortality without obstruction was 23.8 per cent. In cases in which obstruction had taken place, the operative mortality was 53.1 per cent, or more than twice that of the nonobstructive cases.

In every case in which there is a history of abdominal pain or discomfort, with perhaps constipation, and in which physical examination reveals indefinite signs in the lower part of the thorax, a roentgen-ray examination of the chest without delay seems to be clearly indicated. If the roentgenogram demonstrates the presence of a part or of all of the stomach or intestines above the diaphragm, the diagnosis of diaphragmatic hernia is clearly evident. Immediate operative intervention should then be recommended. Only in this way can one hope to make an early diagnosis and to reduce appreciably the operative mortality.

26 East Sixty-Third Street.

CHOREA

A BRIEF CLINICAL STUDY WITH SPECIAL REFERENCE TO THE USE OF AN IMMUNE SERUM *

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WITH THE ASSISTANCE OF

L. J. WILHELMI, M.D.

Resident Physician of the Sarah Morris Hospital during the year 1923

CHICAGO

In 1923, Dr. E. C. Rosenow [1] of Rochester, Minn., reported that he had isolated streptococci which grew on blood agar in small, dry, slightly elevated and nonadherent colonies, surrounded by a brownish-green zone, from the nasopharynx and the tonsils of patients having chorea. After twenty-four hours a narrow zone of hemolysis developed, peripheral to the green zone. By injecting these bacteria into the cranial cavity and into the roots of teeth of various animals, he was able to produce in rabbits a disease much resembling chorea. In addition, examination of the valves of the heart revealed a definite tendency of these organisms to localize there. He prepared a monovalent serum that had the property of agglutinating specifically the organisms he had isolated. He was kind enough to permit us to study the effect of this serum on our patients in the hospital who had chorea.

In planning the work, we enlarged it to attempt a brief clinical study of chorea at the same time.

(*a*) A careful survey devoted to social service attempted to discover any environmental background that might give a clew to the etiology of the disease.

(*b*) In the physical examination, special emphasis was placed on possible foci of infection, especially tonsils and teeth. In view of the effort of some observers to relate chorea to the thyroid, we were careful to examine every patient for any such change.

(*c*) Bacteriologic studies were made on the blood, spinal fluid, tonsils, nasopharynx and teeth.

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* Received for publication, Nov. 2, 1926.

* From the Sarah Morris Hospital for Children of the Michael Reese Hospital.

1. Rosenow, E. C.: Experimental Observations on the Etiology of Chorea. Am. J. Dis. Child. **26**:223 (Sept.) 1923.

(*d*) To determine whether the serum had any effect on complications and recurrences, both the children who received the treatment and those in the control group were kept under observation and were examined frequently for two years.

The social service survey (made by Miss Hazel Lyons), while not throwing any actual light on the etiology of the disease, nevertheless was interesting. Patients having chorea came from the same environment as other ward patients, and nothing definite could be attributed to living conditions. On the other hand, the family background seemed of considerable importance. In the fourteen homes studied, five mothers were found to be subnormal mentally and one actually was insane. In two families one of the grandparents showed deficient mentality. In three other families, the mother admitted having had chorea as a child.

The initial examination, contrary to expectation, showed that 50 per cent of our twenty-seven patients already had had the tonsils removed. In most of the group the nasopharynx was erythematous, and practically every child had one or more carious teeth. However, examination by the attending dentist, Dr. Larson, revealed few abscessed roots, and only a few extractions were indicated. In two patients, shadows in the roentgenogram suggested tracheobronchial lymph nodes, but tuberculin tests were negative.

Practically all children showed cardiac murmurs, but in few was there any definite cardiac enlargement and, strange to say, the most marked cardiac involvements occurred in one child who had tonsils, and in another whose tonsils had been removed previously.

In a majority of the patients, the isthmus of the thyroid was barely palpable. As many of these were girls close to the puberty period, no great significance could be attached to these observations. In none was there any definite enlargement. Metabolism studies were impossible during the acute period.

The temperature of these children varied from 99 to 101, with associated pulse rate. Leukocyte counts averaged from 10,000 to 11,000, with no definite change in the differential count. It must be noted, however, that these temperatures and blood characteristics are common to all children who spend much time in hospital wards.

In regard to bacteriologic studies, cultures of the blood and spinal fluid were uniformly negative, with one exception. In this case a streptococcus, which did not grow on subculture, was isolated from the blood. Examinations of the spinal fluid showed no deviation from the normal.

During this study the children received no medication of any sort and no other treatment except the clearing up of foci of infection and rest in bed. All those who had enlarged tonsils and who did not receive serum were submitted to tonsillectomy, and of course abscessed teeth were extracted.

Serum was given to every other patient, an attempt being made to have controls of approximately the same age. The dosage was that recommended by Dr. Rosenow, namely, 10 cc. intravenously daily for a number of doses. Due to the difficulty of intravenous therapy in children, we gave the serum intramuscularly.

The first serum tried led to severe serum reactions, with temperatures of from 104 to 105, intense urticaria and generalized pains in the joints. During this period, unquestionably the chorea became worse. Later, a purified product obviated this difficulty.

In regard to any immediate effect on the course of the disease, the serum was disappointing. In all the children who received it, the disease ran practically the same course as in those without it; they improved gradually but only on rest in bed prolonged for at least six or eight weeks.

The study of the serum would not have been complete without ascertaining the agglutinating properties on the organisms isolated from the throats of these patients. When in the United States Army, one of us (J. R. G.) had occasion to be in charge of the epidemic of meningitis at Coblenz.[2] The soldiers were treated with serum of American manufacture, which agglutinated meningococci obtained from American laboratories. This serum was a total failure and led to a high mortality. Agglutination studies showed it to be powerless against the organisms contained in the spinal fluid of the American soldiers abroad. Use of the Pasteur serum, which agglutinated this particular strain of meningococcus in the test tube, changed 100 per cent mortality to 100 per cent recovery.

This phase of the study of chorea was done by the bacteriologic department of the Nelson Morris Memorial Institute for Medical Research. Cultures from nasopharyngeal swabs were made from every patient, and in those submitted to tonsillectomy cultures were made from the interior of the tonsillar tissue. Cultures were made also from the pulverized pulp of extracted abscessed teeth.[3]

These studies were of double interest. They showed no particular type of streptococcus to be present uniformly in the throats of these patients. They also showed the serum to be nonspecific in that it agglutinated various strains of streptococci. The results are given in greater detail in tables 1 and 2.

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2. Gerstley, J. R.: An Experience with Epidemic Meningitis, J. A. M. A. **73**:1134 (Oct. 11) 1919.

3. Macroscopic agglutination tests were performed with Rosenow's antistreptococcus serum for chorea and the strains of streptococci isolated from the various sources. To tubes containing varying dilutions of the serum, equal amounts of the streptococcus suspension were added. The tubes were incubated for one hour in a water bath at 55 C. The readings were taken at that time and again after the test had remained in the icebox overnight. Control agglutination tests were made, normal horse serum being used instead of the antistreptococcus serum.

TABLE 1.—*Data of Patients Whose Tonsils Were Removed Before Hospitalization*

Time

TABLE 1.—*Data of Patients Whose Tonsils Were Removed Before Hospitalization*

Name	Sex*	Age	Number of Previous Attacks	Time Since Tonsils Were Removed	Heart	Duration of Stay in Hospital	Serum Given, Cc.	Source of Streptococcic Isolation	Streptococcus Hemolyticus	Streptococcus Anhemolyticus	Agglutination with Rosenow's Antistreptococcus Serum	Agglutination with Horse Serum	Condition Two Years Later
R. O.	♂	7	0	1 year	Slight mitral	8 weeks	0	Blood	0	0	0	0	Still nervous but no symptoms of chorea
								Nasopharynx	0	+	0	..	
E. J.	♂	10	2	3 years	Mitral	16 weeks	0	Blood	+	0	0	..	Severe endocarditis with recurrence of chorea
									Did not grow on subculture				
M. D.	♀	12	1	7 years	Murmur	4 weeks	0	Blood	0	0	0	0	
I. A.	♀	12	1	5 mos.	Mitral	7 weeks	70	Nasopharynx	0	+	0	..	No symptoms of chorea; mitral lesion
								Blood	0	0			
								Blood	0	0			
								Nasopharynx	+	0	2560	0	
								Nasopharynx	+	0	1280	0	
S. G.	♀	11	0	7 years	Slight mitral	8 weeks	70	Blood	0	0	..	..	No symptoms of chorea
								Spinal fluid	0	0			
								Nasopharynx	0	+	0		
								Nasopharynx	0	+	0		
								Nasopharynx	0	+	40		
								Nasopharynx	0	+	0	0	
G. K.	♀	8	1	2 years	Mitral	Chronic	0	Subnormal child	..	..	..	..	No symptoms of chorea
V. S.†	♀	17	1	2 years	Mitral	3 weeks	0	Blood	0	0	0	..	No trace of chorea
								Nasopharynx	0	+	0		
								Nasopharynx	0	+	0		
								Nasopharynx	+	0	0		
								Nasopharynx	+	0	320	20	
								Nasopharynx	0	+	80	0	
S. G.	♀	10	..	2 years	Murmur	12 weeks	70	Nasopharynx	0	+	320	0	Had recurrence but now no symptoms of chorea
								Nasophraynx	0	0	0	0	
								Blood	0	0	0	0	
								Spinal fluid	0	0	0		
								Nasopharynx	+	0	0	0	
								Nasopharynx	0	+	0	0	
R. R.	♀	9	0	5 years	Murmur	18 weeks	70	Nasopharynx	0	+	160	0	Trace of chorea
								Nasopharynx	0	+	0		
								Nasopharynx	0	+	10		
								Nasopharynx	0	+	160		
								Nasopharynx	+	0	0		
								Blood	0	0	0		
								Blood	0	+	Did not grow		
								Tooth	0	+			
								Nasopharynx	0	+	320	0	
								Nasopharynx	0	+	0	0	
N. S.	♂	10	0	2 years	Slight mitral	14 weeks	70	Blood	0	0	40	0	Nervous but no symptoms of chorea; slight mitral lesion
								Blood	0	0	0	0	
								Nasopharynx	0	+	80	0	
								Nasopharynx	0	+	40	0	
F. F.	♀	9	1	.....	Murmur	8 weeks	0	.....	..	..	..	..	No symptoms of chorea
M. G.	♀	10	2	5 mos.	Mitral	2 weeks	0	.....	..	..	..	..	No symptoms of chorea
A. R.	♀	8	2	6 years	Mitral	3 months	70	Nasopharynx	+	0	0	..	In hospital with recurrence
								Nasopharynx	+	0	0		

* In this column, ♂ indicates male; ♀, female.

† Chorea of pregnancy.

TABLE 2.—*Data of Patients Whose Tonsils Were Removed During Period of Hospitalization or After*

Name	Sex*	Age	Number of Previous Attacks	Heart	Duration of Stay in Hospital	Serum Given, Cc.	Source of Streptococcic Isolation	Streptococcus Hemolyticus	Streptococcus Anhemolyticus	Agglutination with Rosenow's Serum	Agglutination with Horse Serum	Condition Two Years Later
K. L.	♀	7	1	Mitral	3 months	70	Tonsil tissue	0	+	0	0	One recurrence; now in hospital with new attack
							Blood	0	0	0	..	
A. N.	♀	11	2	Mitral	16 weeks	0	Nasopharynx	0	+	0	0	No symptoms of chorea
							Nasopharynx	0	+	0	0	
							Blood	0	0	0	0	
							Spinal fluid	0	0	0	0	
							Tonsil tissue	+	0	20	0	
							Nasopharynx	0	+	0	0	
M. B.	♀	9	..	Mitral	16 weeks	0	Nasopharynx	0	0	0	0	No symptoms of chorea
							Nasopharynx	0	+	0	0	
							Nasopharynx	0	+	0	0	
S. W.	♀	8	1	Murmur	3 weeks	0	Nasopharynx	+	0	0	0	No symptoms of chorea
							Blood	0	0	0	0	
G. J.	♂	11	1	Murmur	5 weeks	0	Blood	0	0	0	0	No symptoms of chorea
							Tonsil tissue	+	0	0	0	
E. P.	♀	9	2	Mitral	3 weeks	0	Blood	0	0	0	0	Had slight recurrence, but now no symptoms of chorea
							Nasopharynx	0	+	0	0	
							Nasopharynx	0	0	0	0	
							Nasopharynx	+	0	640	0	
							Nasopharynx	0	+	0	0	
							Tooth	0	+	0	0	
							Tonsil tissue	0	+	0	0	
F. G.	♀	12	0	Murmur	9 weeks	0	Tonsil tissue	0	+	10	0	No symptoms of chorea
							Nasopharynx	0	+	80	0	

H. H.	♀	7	0	Mitral	9 weeks	0	Nasopharynx.....	+	0	0	0	No symptoms of chorea; but nervous
							Nasopharynx.....	+	0	80	0	
							Blood.....	0	0	0	0	
							Blood.....	0	0	0	0	
							Nasopharynx.....	+	0	0	0	
							Nasopharynx.....	0	+	0	0	
							Tonsil tissue.....	+	0	0	0	
S. W.	♂	7	0	Normal	8 weeks	0	Nasopharynx.....	+	0	0	0	No symptoms of chorea
							Nasopharynx.....	0	0	0	0	
							Nasopharynx.....	+	0	0	0	
							Tooth.....	0	+	0	0	
							Nasopharynx.....	0	+	640	0	
							Tonsil tissue.....	0	+	640	0	
H. M.	♀	4	0	Systolic murmur	12 weeks	70	Blood.....	Streptococcus did not grow on subculture		80	0	No symptoms of chorea; slight systolic murmur
							Nasopharynx.....	+	0	20	0	
							Blood.....	0	0	0	0	
							Nasopharynx.....	0	+	320	0	
M. K.	♂	8	0	Normal	7 weeks	0	Blood.....	0	0	0	0	No symptoms of chorea
							Nasopharynx.....	0	+	0	0	
							Nasopharynx.....	0	+	40	0	
							Tonsil tissue.....	0	+	40	0	
D. K.	♀	6	1	Mitral	12 weeks	70	Blood.....	0	0	0	0	Recurrence and severe endocarditis
							Blood.....	0	0	0	0	
							Tonsil tissue.....	0	+	40	0	
S. B.	♀	12	1	Normal	3 weeks	0	Nasopharynx.....	0	+	0	0	No symptoms of chorea
							Nasopharynx.....	+	+	0	0	
							Blood.....	0	0	0	0	
							Tonsil tissue.....	+	0	20	0	
L. K.	♀	8	0	Murmur	.....	70	Nasopharynx.....	0	+	0	0	No symptoms of chorea
							Nasopharynx.....	0	+	160	0	
							Tooth.....	0	+	0	0	
							Blood.....	0	+	Did not grow	0	
							Nasopharynx.....	+	0	60	0	
							Nasopharynx.....	+	0	0	0	
							Tonsil tissue.....	+	0	0	0	
							Nasopharynx.....	0	+	0	0	
							Nasopharynx.....	0	0	0	0	

* In this column, ♂ indicates male; ♀, female.

Nothing can be said in regard to any beneficial effect of the serum on complications or recurrences. There were surprisingly few permanent cardiac changes in the treated or untreated patients. Of the thirteen patients in the group in which tonsillectomy had been performed, definite cardiac pathologic changes were found two years later in two who had received serum and in one who had had none. Two in this group who had serum suffered from recurrence of the chorea, while there was only one recurrence among those not having the serum.

Of the fourteen patients having tonsillectomy in the hospital or after discharge, one who received serum showed definite changes in the heart after two years, and two who had serum suffered from a recurrence of chorea, while only one recurrence took place among those who did not receive serum.

The effect of tonsillectomy was likewise disappointing. No immediate effect was obtained from removal of the tonsils. As at the end of two years all patients had been submitted to tonsillectomy, it is impossible to state whether the number of complications and recurrences would have been greater in a nontonsillectomized group. At any rate tonsillectomy had no immediate effect and certainly did not prevent the development of recurrences. One must note from tables 1 and 2 that the number of previous attacks of chorea before hospitalization was no less in the tonsillectomized group than in the control group. The relation of the tonsils to the condition, however, was interesting and mysterious. In two patients, tonsillectomy performed some time after the discharge from the hospital led to an immediate recurrence. In another the operation apparently lighted up an acute endocarditis.

Concerning recurrences, it was interesting to note that these took place in one patient whose mother was in an insane asylum and in others whose mothers suffered from chorea in childhood.

In only one patient could striking improvement be attributed to any definite therapy. This was in a girl, aged 17. She had had other attacks of chorea and one year previously had had a tonsillectomy performed. She entered the hospital with a severe chorea of pregnancy which rapidly grew worse. Her life would have been threatened if the pregnancy had not been terminated. The chorea disappeared almost as if by crisis.

In this connection it is also interesting to note that a large majority of our patients were girls and that the chorea disappeared permanently after puberty.

CONCLUSIONS

It is not our purpose in this article to support or to refute the idea of the streptococcic origin of chorea; the argument would readily be raised that the organisms we obtained from cultures of the nasopharynx were not the true organisms of chorea. In view of the foregoing observations

and the lack of any evidence of really severe infection in any of the series, however, one is almost tempted to advance the hypothesis that there are two kinds of chorea, one of definite infectious origin and another due to the overtaxing of a predisposed nervous system through overwork and overstudy. At any rate, our studies have proved definitely the following:

1. The monovalent serum in its present form is of no clinical value in the treatment of chorea.

2. There is great variation in the types of streptococci produced from cultures by ordinary methods in the throats of patients having chorea.

3. A monovalent serum prepared by the use of the Rosenow chorea streptococcus is not absolutely specific but does agglutinate other types of streptococci.

4. Tonsillectomy apparently did not have any influence on the course of the disease or on the development of recurrences, though we are not prepared to state its influence on the development of complications.

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POSTDIPHTHERITIC PARALYSIS

THE CEREBROSPINAL FLUID IN LOCAL AND GENERAL FORMS *

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The literature contains few reports on the spinal fluid in postdiphtheritic paralysis, and these refer to records usually of only one or two cases, with investigation restricted to the routine examination for albumin, sugar and cells. Among the authors who have contributed data on the subject are De Massary, Dufour, Comby and Netter,[1] Marfan,[2] Rohmfeld, Chauffard and Le Conte,[3] Ravout and Krolinetsky,[4] Hallez and Lortat-Jacob [5] and Regan.[6] De Lavergne [7] has recently given quantitative sugar determinations in three cases, and Regan and Wilson [8] have reported the reactions encountered with Lange's colloidal gold test.

It is not too much to say that the extent of the involvement of the nervous system manifest in the many cases of the more severe forms of postdiphtheritic paralysis is an indication for the more careful study of the spinal fluid, not only from the point of view of differential diagnosis but also because of the possibility that some assistance may be rendered

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1. De Massary, Dufour, Comby, and Netter, quoted in Bull. et mém. Soc. méd. d. hôp. de Paris **45**:1097 (July 15) 1921.

2. Marfan, A. B.: Leçons cliniques sur la diphtherie et quelques maladies des premières voies, Paris, 1905, p. 216.

3. Chauffard and Le Conte: Paralysie nucleaires multiples d'origine diphterique avec réaction méninges, Bull et mém. Soc. méd. d. hôp. de Paris **39**:997 (Nov. 12) 1915.

4. Ravout, P., and Krolinetsky, G.: Paralysie diphterique generalisie avec réaction méngingee, Bull et mém. Soc. méd. d. hôp. de Paris **40**:913 (June 9) 1916.

5. Hallez, G. L., and Lortat-Jacob: Le liquide cephalorachidien dans les paralysies diphteriques, Bull. et mém. Soc. méd. d. hôp. de Paris **41**:1259 (July 6) 1917.

6. Regan, J. C.: Postdiphtheritic Paralysis and Spinal Fluid Findings, Arch. Pediat. **35**:641 (Nov.) 1918.

7. De Lavergne, M.: De l'alteration du liquide cephalorachidien dans les paralysies diphteriques du voile du palais et a type de polyneurite, Bull. et mém. Soc. méd. d. hôp. de Paris **44**:1246 (Oct. 22) 1920.

8. Regan, J. C.; Regan, C., and Wilson, B.: The Characteristics of the Cerebrospinal Fluid in Postdiphtheritic Paralysis, Am. J. Dis. Child. **25**:284 (April) 1923.

toward a more complete understanding of the pathogenesis of the disease, and possibly toward some therapeutic clue.

Reports of fifteen cases are included in the present study. The form of diphtheria that preceded the onset of paralysis in the patients observed in the acute stage was usually of a septic type, with extensive membranes covering most of the mucous membrane of the throat and with involvement in many cases of the nose, and in a few, of the larynx. The usual picture of the septic and toxic form of diphtheria with well developed adenitis and periadenitis and early myocarditis was present. Four of the patients were admitted in the postmembranous period with well developed paralysis.

The paralysis was classified as purely local in three patients, local with suggestive general involvement in five and typically generalized (following a local involvement) in seven. The disease proved fatal in three of the generalized cases from respiratory paralysis.

MACROSCOPIC APPEARANCE OF THE CEREBROSPINAL FLUID

The fluid was clear, watery and limpid, without any appearance of ground glass, and no fibrin web was observed after it had been allowed to stand. In two instances a xanthrochromatic tinge was observed, following a previous puncture which revealed blood stained fluid.

Tension.—The tension was generally slightly and often moderately increased, measured roughly by the rate of flow of the fluid and the amount obtained in a certain period of time.

Cytology.—The cells, concerning which there has been a disagreement among several writers, showed again in all thirty-four counts the same characteristics as we have previously reported in twenty-nine cell counts, namely, a normal number of cells per cubic millimeter. It would seem, therefore, that an augmentation of cells is entirely exceptional in either the local or the general forms of postdiphtheritic paralysis. If such increases occur at all in exceptional cases they are probably transient.

Protein Content.—The albumin content showed an increase in twenty-seven spinal fluids; this occurred exclusively in cases showing generalized or suggestive generalized paralysis. A slight increase (1 plus reaction) occurred in thirteen fluids and a moderate increase in ten, while four showed a marked increase. Table 1 shows the relation of the protein increase to the form of the disease. This appears to indicate that, while cytologic changes are exceptional in postdiphtheritic paralysis, an increase of albumin is common, and this increase occurs mostly in cases showing definite generalized involvement of the nervous system. There appears to be a distinct relation, then, between the presence or absence of protein in the fluid and the form of paralysis.

Sugar Content.—The sugar content of the fluid was determined by means of the rough estimation of the degree of reduction of Fehling's solution. The reactions observed were normal values, as indicated by a three plus reduction.

Chloride Content.—The chlorides were determined in thirty fluids and showed a range generally of between 7.3 and 7.7, with the exceptionally high figure of 8.5 in one fluid. The average value was 7.55. The only previous determination in the literature was one by Ducamp and Carrieu [9] in which they found 6.9 Gm. per liter. If the normal value for chlorides is considered as from 7.20 to 7.50 (Mestrezat) it is found that thirteen of the fluids presented figures somewhat above the normal. However, the variations were not pronounced and the significance, if any, is not obvious without an estimation of the blood chlorides.

TABLE 1.—*Relation of Protein Increase to Form of the Disease*

Albumin Reaction	Fluids from Cases		
	Local Paralysis	Local Paralysis Suggestive Generalized	General Paralysis
±	3	3	1
1+	1	5	7
2+	..	4	6
3+	..	0	4

Permanganate Index (Mayerhofer).—Determinations were carried out on fifteen fluids. The values obtained ranged from an index of 1.0 to 3.5. The average was 2.3. If the normal index was considered as less than 2, most of the fluids showed pathologic changes.

Meningeal Permeability.—No record of the employment of the meningeal permeability test was found in the literature. The nitrate permeability test was selected because of simplicity of the quantitative determination as compared to the iodids. One gram of sodium nitrate for every 30 Kg. of body weight was administered in water three hours before lumbar puncture. The quantity of sodium nitrate present in the fluid was determined by colorimetric comparison with standard solutions, in the presence of pure sulphuric acid, diphenylamin in sulphuric acid being used as indicator.

Alteration in meningeal permeability was not detected in twenty of the twenty-three fluids tested. In the remaining three a slight increase permeability of from 15 to 20 mg. was observed.

Acetone Content.—An examination for acetone, by Mestrezat's method, was carried out on nineteen fluids. It was found in only three. Two of these showed a moderate reaction and were from patients (1654 and 953) who were gravely ill and who died within a few days. The other was in a patient (602) with generalized paralysis

9. Ducamp and Carrieu: Bull. et mém. Soc. méd. d. hôp. de Paris **44**:55, 1920.

and pronounced cachexia in whom the reaction was only one plus. It would not have been surprising to find acetone more common because of the frequency of some degree of inanition in many generalized cases of postdiphtheritic paralysis.

Colloidal Gold Reaction.—This test was not performed in the present study, but attention may be drawn appropriately to some previous results, so as to afford a basis of comparison with the colloidal benzoin reaction, a description of which will follow. In this previous report, the colloidal gold reaction had been performed in twenty-eight spinal fluids. In twenty-seven, the fluids were from cases showing generalized paralysis and gave a reduction constantly in the first six dilutions (1:10 to 1:320) in the leutic zone extending in two instances into the meningitic zone. In one patient with localized paralysis, the reaction was negative. As the patients improved clinically, the reaction seemed to subside, and in two, who were followed to the eleventh and thirteenth week, respectively, the curve had reached a normal level.

Colloidal Benzoin Reaction.—The colloidal benzoin reaction was described recently by Guillain, Laroche and Lechelle,[10] and the technic may be obtained in the original article or in several subsequent publications including a recent one by one of us.[11] It is more simple to perform and to read than is the colloidal gold test, and the reactions in the syphilitic zone are more strictly limited to syphilitic diseases of the central nervous system.

In the present study, the colloidal benzoin reaction was performed on twenty-eight fluids. Three fluids were from patients with a purely local paralysis of the palatine type, and in all such cases the benzoin reaction was negative. Ten fluids were from patients in whom a local paralysis was accompanied by suggestive signs of generalized involvement, such as a loss of deep reflexes, paralysis of accommodation, strabismus and cardiac arrhythmia, but in whom a clear-cut picture of the so-called diphtheritic polyneuritis was not present (cases 976, 726, 485, 1428, 1459). The spinal fluid in each of these patients, when taken at a period of the disease when generalized involvement was suggested, showed a slight reaction with benzoin, limited to two tubes, usually 8 and 9. The remaining fifteen fluids from patients with generalized paralysis (1541, 953, 648, 831, 986, 602, 1654) presented reactions in the meningitic zone, the extent of precipitation being remarkably proportionate to the stage of the paralysis and the extent of the involvement, as will be seen in table 2. It will be observed that with early local paralysis the precipitation is negative and begins to appear as the

10. Guillain, G.: Laroche, G., and Lechelle, P.: La reaction du benzoin colloidal, Paris, Masson et Cie, 1922.

11. Regan, J. C.: The Colloidal Benzoin Reaction in Acute Poliomyelitis, Am. J. Dis. Child. **30**:844 (Dec.) 1925.

TABLE 2.—*Spinal Fluid Examinations**

Age; Case No.; Date of Onset	Type of Diphtheria	Day of Disease Antitoxin Given	Amount of Antitoxin in Units	Time During Disease Paralysis Developed	Distribution of Paralysis	Termination of Case	Day of Disease Puncture Was Performed	Spinal Fluid Examinations								Form of Paralysis
								Cell Count	Albumin	Sugar	Permanganate Index	Acetone	Chlorides Gm. per Liter	Nitrate Permeability Mg.	Colloidal Benzoin	
8 years 563 3/15/25	Septic pharyngeal	Third	30,000 A. A.	4th week	Palatine	Recovery	37th	2	±	3+	...	..	7.70	..	000 000 000 000 000	Local
4 years 735 4/1/25	Septic nasal pharyngeal	Fourth	50,000 B. A. 60,000 A. A.	24th day	Palatine	Recovery	30th 34th	0 0	± 1+	3+ 3+	... ...	.. ..	7.60 7.50	Less than 10 10	000 000 000 000 000 000 000 000 000 000	Local
9 years 1548 7/12/25	Septic phayrngeal	Third	60,000 A. A.	23d day	Palatine	Recovery	28th	0	±	3+	...	..	....	10	.....	Local
4 years 1428 6/19/25	Pharyngeal, nasal and laryngeal	Third	25,000 B. A. 20,000 A. A.	4th week	Cardiac arrhythmia, palatine ?	Recovery	38th 50th	0 0	2+ 1+	3+ 3+	... 2.2	.. ..	7.10 7.50	10 15	000 000 012 000 000	Local and suggestive generalized
4 years 1459 5/25/25	Nasal	Fourth	25,000 A. A.	14th day 28th day	Palatine Knee reflex absent, slight muscular hypotonicity	Recovery	31st 54th	0 0	± 2+	3+ 3+	2.2 1.9	.. ..	7.30 7.40	10 10	000 000 000 000 000 000 000 002 200 000	Local and suggestive generalized
8 years 976 4/25/25	Septic pharyngeal	Third	60,000 A. A.	11th day 19th day	Palatine Int. strabismus	Recovery	14th 25th 31st	3 0 0	1+ ± 2+	3+ 3+ ...	... 2.3 2.1	— — —	7.80 7.70 7.50	10 20 10	..... 000 000 000 011 000 000 000 000 000 000	Local and suggestive generalized
8 years 485 3/4/25	Septic pharyngeal	Fifth	70,000 A. A.	12th day	Palatine, cardiac arrhythmia	Recovery	35th	0	1+	3+	2.2	—	7.40	..	000 000 011 000 000	Local and suggestive generalized
11 years 726 4/1/25	Nasal pharyngeal	Fourth	50,000 A. A.	15th day 33d day	Palatine Accommodation, cardiac arrhythmia, knee reflex absent	Recovery	17th 22d 30th 49th	0 1 0 0	1+ ± 1+ 2+	3+ 3+ 3+ 3+	1.2 ... ... 2.3	— — — —	7.50 7.75 .... 7.55	 10	000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 021 000 000	Local and suggestive generalized
9 years 831 4/9/25	Septic pharyngeal	Fourth	10,000 B. A. 50,000 A. A.	13th day 34th day	Palatine Pharyngeal; accommodation, nystagmus, cardiac arrhythmia, knee reflex absent	Recovery relapse	14th 42d 48th	0 0 2	1+ 1+ 2+	3+ 3+ 3+	... 2.8 2.9	.. — —	7.95 7.50 7.50	Less than 10 10 From 15 to 20	000 000 000 000 000 000 000 011 200 000 000 000 000 222 100	Generalized

5 years 986 4/27/25	Septic nasal phayngeal	Third Fourth	5,000 B. A. 62,000 A. A.	18th day	Cardiac arrhythmia	Recovery	29th	1	2+	3+	3.2	—	7.60	Less than 10	000 000 120 000 000	Generalized
				35th day	Palatine		38th	0	2+	3+	...	..	7.70	10	000 000 022 210 000	
				39th day	Weakness lower extremities, neck, back		57th	0	3+	3+	1.7	—	7.41	10	000 000 022 200 000	
				43d day	Muscles of articulation, upper extremities											
4 years 602 2/22/25	Unknown B. A.	?	5,000 B. A.	28th day on admission	Palatopharyngeal; weakness of upper and lower extremities; diaphragm and intercostals weak (empyema)	Recovery	40th	0	1+	3+	1.0	+	7.10	Less than ..	000 000 221 000 000	Generalized
							54th	0	1+	3+	1.4	—	7.30	..	000 000 111 000 000	
							67th	1	2+	3+	...	—	7.80	10	000 000 021 000 000	
							113th	2	1+	3+	...	..	7.38	10	000 000 022 000 000	
3 years 1654 6/3/25	Unknown B. A.	?	Unknown	3d week history on admission	Both lower extremities, diaphragm, palatopharyngel, neck and back, massive atelectatic accommodation	Died 47th day	44th	0	2+	3+	...	2+	7.30	..	.....	Generalized
16 mos. 1541 6/24/25 ?	Unknown B. A.	None	..	4th week history on admission	Palatopharyngeal, muscles respiratory, lower extremities	Died 29th day ?	29th	0	1+	3+	...	..	7.70	..	000 002 222 100 000	Generalized
7 years 953 3/27/25	Unknown B. A.	Seventh	20,000 B. A.	2d week on admission	Palatine, lower extremities, pharyngeal, accommodation, sensory incoordination, cardiac arrhythmia, weak upper extremity, respiratory paralysis	Died 44th day	33d	0	2+	3+	...	—	....	Less than 10	000 000 022 200 000	Generalized
							39th	0	3+	3+	...	2+	7.5			
							44th 1 hour p. m.	6	3+							
11 years 648 3/23/25	Septic pharyngeal and nasal	Fourth	10,000 B. A. 50,000 A. A.	25th day	Palatine accommodation, pupillary inequality, muscular weakness lower limbs, sensory ataxia, nystagmus	Recovery	37th	0	±	3+	...	..	7.6	Less than 10	000 000 021 000 000	Generalized
				46th day			41st	0	1+	3+	...	..	8.5	10	000 000 000 000 000	
				53d day			57th	0	3+	3+	3.5	—	7.4	10	000 000 022 200 000	

* In the table, A. A. signifies after admission to the hospital, and B. A. before admission to the hospital.

generalized involvement is manifest and is proportionate to it. The retrogression of paralysis is accompanied by a corresponding improvement in the condition of the cerebrospinal fluid. At the height of the paralysis, a reaction is encountered in the meningitic zone in at least three tubes, often in four.

The colloidal benzoin reaction, therefore, seems to afford a delicate test in interpreting the extent of the involvement of the nervous system in patients with postdiphtheritic paralysis.

SUMMARY

The cerebrospinal fluid from fifteen cases of postdiphtheritic paralysis was studied in regard to its macroscopic appearance, cell count, protein, sugar, chloride and acetone content, permanganate index, meningeal permeability to nitrate and colloidal benzoin reaction. The summarized results of these analyses follow:

1. The cerebrospinal fluid in postdiphtheritic paralysis is clear, limpid and transparent, and is of normal macroscopic appearance; it does not form a fibrin web on standing.

2. The cell count in sixty-three examinations was within normal limits.

3. The albumin showed an increase of a slight or moderate degree in twenty-seven of thirty-four fluids. This increase bore a definite relation to the extent of paralysis, being limited, practically, to patients with a generalized involvement. Hence, a common spinal fluid formula is an albuminocytologic dissociation.

4. The sugar reaction was normal in all fluids.

5. The chlorides were determined in thirty fluids, with results ranging from 7.1 to 8.5 Gm. per liter, the average being 7.55 Gm. In thirteen fluids, values were obtained slightly above the normal range.

6. The permanganate index was determined in fifteen examinations, and showed an index ranging from 1.0 to 3.5, with an average of 2.3.

7. The meningeal permeability to sodium nitrate was studied in twenty-three fluids. In twenty the normal figure of 10 mg. or below was the value found, while in three a slight increase permeability seemed indicated by the figure of from 15 to 20 mg. per liter.

8. The examination for acetone was carried out in nineteen fluids and in only three was a reaction found. Two of the moderate reactions occurred in fatal cases in which the fluid was taken from desperately ill children within a few days of death. The other was in a patient with generalized paralysis and pronounced cachexia in whom the reaction was only one plus.

9. The colloidal gold reaction was omitted in the present series, but in a previous study of twenty-eight fluids it gave a reduction in twenty-

seven from patients with generalized paralysis, constantly in the first five or six tubes of the luetic zone. In one fluid from a patient with local paralysis the reaction was negative. As the patients improved clinically, the reaction seemed to subside.

10. The colloidal benzoin reaction was performed on twenty-eight fluids. Three fluids were from patients with purely local paralysis of the palatine type, and in all of these, the benzoin reaction was negative. Ten fluids were from cases in which a local paralysis was accompanied by suggestive generalized involvement and here a slight reaction in two tubes (8 and 9) was present. In the remaining fifteen fluids from patients with generalized involvement, there was a reaction in the meningitic zone, the extent of precipitation being remarkably proportionate to the stage of the paralysis and the extent of involvement.

RESPIRATORY METABOLISM IN INFANCY AND IN CHILDHOOD

V. EFFECT OF MODERATE EXERCISE ON THE RESPIRATORY QUOTIENT: STUDY OF FOUR CHILDREN *

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In this paper we deal with a comparative study of the effect of mild activity and of rest on the proportions of foodstuffs metabolized as calculated from determinations of the respiratory quotient. At present the only satisfactory method for determining the type of foodstuffs which undergo oxidation within the body at a given time is the measurement of the respiratory quotient and of the elimination of nitrogen in the urine. Few workers have studied the effect of exercise on the respiratory quotient in children.

LITERATURE

There is still a controversy concerning the nature of the foodstuffs utilized to provide energy for muscular movement. Continental workers, represented by Krogh and Lindhard,[1] Meyerhof,[2] Furusawa,[3] Hill [4] and others have presented experimental evidence to prove that carbohydrate alone is the fuel of muscular contraction. On the other hand, Lusk [5]

* Received for publication, Feb. 16, 1927.

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1. Krogh, A., and Lindhard, J.: The Relative Value of Fat and Carbohydrate as Sources of Muscular Energy, Biochem. J. **14**:290, 1920.

2. Meyerhof, O.: Zur Verbrennung der Milchsaüer in der Erholungsperiode des Muskels, Arch. f. d. ges. Physiol. **175**:88, 1919.

3. Furusawa, K.: Muscular Exercise, Lactic Acid, and the Supply and Utilization of Oxygen: IX. Muscular Activity and Carbohydrate Metabolism in the Normal Individual, Proc. Roy. Soc. ser. B, **98**:65 (May) 1925. Furusawa, K.; Hill, A. V.; Long, C. N. H., and Lupton, H.: Ibid. VIII. Muscular Exercise and Oxygen Requirement, Proc. Roy. Soc. ser. B, **97**:167 (Dec.) 1924.

4. Hill, A. V.: Muscular Activity, The Williams and Wilkins Company, Baltimore, 1926.

5. Lusk, G.: Die Energiequelle bei der Muskelarbeit, Biochem. Ztschr. **156**: 334, 1925.

and other American workers [6] believe that fat can be burned directly by muscle without first being converted into carbohydrate. Both sides of the question have recently been discussed by Hill [4] and by Lusk.[5]

Recent studies seem to show that in diabetes mellitus, exercise lowers the respiratory quotient; however, the severity of the disease and the degree and duration of activity probably are important factors in the results. Differences in these factors may explain some of the apparently inconsistent results. Benedict and Joslin [7] found a slight elevation in the respiratory quotient when a patient with diabetes moderately increased his consumption of oxygen by twitching his muscles. Allen and Du Bois [8] found a similar increase in a patient with diabetes. Hetzel and Long [9] report the results of a large number of exercise experiments on three diabetic patients who were receiving insulin. They found an elevation in the respiratory quotient in all cases. The rise depended on the duration and severity of the exercise and on the time interval between the experiment and the last injection of insulin. A lowering of the respiratory quotient was found by Salomon,[10] in two patients with severe diabetes. Grafe and Salomon [11] found a fall in the quotient but an increase in the total amount of sugar oxidized during severe exercise on an ergostat. Richardson and Levine [6] found that exercise lowered the respiratory quotient in both mild and severe cases of diabetes. They also found an increase in the total amount of sugar burned.

The lowering of the respiratory quotient suggested that with the increased utilization of fat there might be an accompanying increase in the production of ketone bodies. Evidence supporting this view was obtained from experiments on both diabetic patients and normal

6. Richardson, H. B., and Levine, S. Z.: Clinical Calorimetry: XXXIX. Exercise and the Respiratory Quotent in Diabetes, J. Biol. Chem. **66**:161 (Nov.) 1925. Loebel, R. O.; Barr, O. P.; Tolstoi, E., and Himwich, H. E.: Studies on the Effect of Exercise in Diabetes: II. Lactic Acid Formation in Phlorhizin Diabetes, J. Biol. Chem. **61**:9 (Aug.) 1924. Anderson, R. J., and Lusk, G.: Animal Calorimetry. The Interrelation betwen Diet and Body Condition and the Energy Production during Mechanical Work, J. Biol. Chem. **32**:421 (Dec.) 1917.

7. Benedict, F. G., and Joslin, E.: Carnegie Institution of Washington, publication 136, 1910, p. 217.

8. Allen, F. M., and Du Bois, E. F.: Clinical Calorimetry: XVII. Metabolism and Treatment in Diabetes, Arch. Int. Med. **17**:1010 (June) 1916.

9. Hetzel, K. S., and Long, C. N. H.: The Metabolism of the Diabetic Individual During and After Muscular Exercise, Proc. Roy. Soc., ser. B **99**:279 (March) 1926.

10. Salomon, H., quoted from von Norden: Metabolism and Practical Medicine, Chicago, W. T. Keener & Co., 1907, vol. 7, p. 542

11. Grafe, E., and Salomon, H.: Ueber den Einfluss der Muskelarbeit auf die Intensität der Zuckerverbrennung beim Diabetiker, Deutsches. Arch. f. klin. Med. **139**:369 (May) 1922.

persons who were on a high fat diet.[12] This question will not be discussed, since we did not study this phase of the subject.

METHODS

A description of the technical procedures, the metabolism ward,[13] the apparatus and the calculation of results[14] has been published previously. The reliability of the apparatus was controlled by frequent alcohol checks, a detailed report of which was presented in previous papers (checks for the year ending July, 1925, in paper 1[14] and for those ending July, 1826, in paper 4[15]).

During the year ending July, 1925, the respiratory quotients secured from alcohol, which are used as a means of calculating the foodstuffs oxidized, averaged 0.671, with maximum variations from 0.66 to 0.68 for individual determinations of from two to three hours' duration, as compared with the theoretic quotient of 0.667. For the year ending July, 1926, the respiratory quotients from alcohol averaged 0.668 with maximum variations from 0.66 to 0.67 for individual determinations of two or more hours' duration.[15]

Two groups of observations were conducted. One group consisted of observations covering four consecutive hours, two of which were basal periods and two exercise periods. The second group consisted of basal and exercise periods determined on separate days.

During exercise periods the patient alternately raised and lowered the head, arms and legs, and rolled from side to side. These movements were started immediately after the beginning of each exercise period and continued for from twenty-five to thirty minutes. Following the exercise, there was a resting interval of at least twenty-five minutes before the close of the period. The degree of activity was estimated from the heat produced.

The preparation of the patient and the conduction of the rest and exercise experiments which were performed on separate days were essentially the same in each instance. The occasional differences are noted in table 1.

The reliability of technic and methods will be discussed later in this paper.

12. Forssner, G.: Ueber die Einwirkung der Muskelarbeit auf die Acetonkörperausscheidung bei kohlenhydralarmer Kost, Skandin. Arch. f. Physiol. **22**:393, 1909. Preti, L.: Die Muskelarbeit und deren ketogene Wirkung, Biochem. Ztschr. **32**:231, 1911.

13. Wilson, J. R.; Levine, S. Z., and Rivkin, H.: The Respiratory Metabolism in Infancy and in Childhood: II. Ketosis and the Respiratory Exchange in Children, Am. J. Dis. Child. **31**:335 (March) 1926.

14. Levine, S. Z., and Wilson, J. R.: The Respiratory Metabolism in Infancy and in Childhood: I. Basal Metabolism of Children, Am. J. Dis. Child. **31**: 323 (March) 1926.

15. Levine, S. Z., and Wilson, J. R.: The Respiratory Metabolism in Infancy and in Childhood: IV. The Elimination of Water through the Skin and Respiratory Passages in Children, Am. J. Dis. Child. **33**:204 (Feb.) 1927.

TABLE 1.—*Calorimeter Data in Terms of Averages Per Hour*

No.	Name	Exp. No.	Date	Weight, Kg.	Surface Area,* Sq. M.	Time	Carbon Dioxide, Gm. per Hour	Oxygen, Gm. per Hour	Respiratory Quotient	Urine Nitrogen, Gm. per Hour	Indirect Calories per Hour	Relative Humidity†	Activity	Previous Diets‡ Protein, Gm.	Carbohydrate, Fat, Gm.	Carbohydrate, Gm.	Remarks§
						(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5	Nita H.	41	4/24/25	19.3	0.785	10:49 a.m. to 12:50 p.m.	11.53	10.82	0.775	0.2040	35.75	54.0	Quiet	45	72	24	Last meal at 6:15 a.m.
		42	4/25/25	19.1	0.78	10:45 a.m. to 12:45 p.m.	13.39	12.64	0.770	0.2180	41.74	55.0	Active	45	72	24	Last meal at 6:30 a.m.
		51	5/13/25	19.8	0.795	4:30 p.m. to 6:30 p.m.	10.92	9.40	0.845	0.1372	31.69	46.0	Quiet	35	63	175	Last meal at 10:15 a.m.
		36	4/15/25	19.6	0.79	10:35 a.m. to 12:35 p.m.	14.04	12.03	0.849	0.1638	40.62	72.0	Active	35	42	90	Last meal at 6:00 a.m.
2	Esther F.	12	1/14/25	22.4	0.90	10:10 a.m. to 12:10 p.m.	11.41	10.68	0.777	0.1727	35.35	44.7	Quiet	0	0	0	Fasting for 37 hours
		7	1/ 3/25	22.6	0.90	11:15 a.m. to 2:15 p.m.	14.72	13.71	0.781	0.2319	45.35	67.0	Active	0	0	0	Fasting for 42 hours
10	Margaret V. d. H.	67	11/27/25	31.36	1.10	1:00 p.m. to 2:30 p.m.	15.25	14.08	0.788	0.2583#	46.68	62.0	Quiet	50	95	70	Last meal at 8:30 a.m.
						2:30 p.m. to 4:30 p.m.	21.38	19.62	0.793	0.2583#	65.32	72.0	Active				
6	Fred A.	60	10/30/25	28.9	1.068	11:45 a.m. to 1:45 p.m.	12.80	11.58	0.804	0.2586	38.45	48.0	Quiet	40	115	50	Last meal at 8:00 p.m., Oct. 29
						1:45 p.m. to 3:51 p.m.	17.58	15.70	0.814	0.2267	52.51	48.5	Active	..	..	..	Insulin, 10 units at 7:30 p.m.
		66	11/25/25	28.7	1.06	11:30 a.m. to 1:30 p.m.	12.36	11.15	0.807	0.2156	37.12	37.0	Quiet	50	115	45	Last meal at 7:00 p.m., Nov. 24
						1:30 p.m. to 3:30 p.m.	17.44	15.63	0.812	0.1461	52.41	44.0	Active	..	..	..	Insulin, 8 units at 6:30 p.m.
		61	11/ 4/25	29.0	1.07	12:15 p.m. to 2:15 p.m.	19.75	18.54	0.775	0.2486	61.42	50.0	Active	50	100	30	Last meal at 8:00 p.m., Nov. 3
						2:15 p.m. to 4:15 p.m.	13.52	12.19	0.807	0.2952	40.48	49.0	Quiet	..	..	..	Insulin, 8 units at 7:30 p.m.

* Surface area from Boothby's diagram of Du Bois height-weight formula (Boston M. & S. J. **185**: 337, 1921).
† The maximum reading taken during the experiment.
# Average of combined urine of rest and exercise periods.
‡ All of the patients received the diet indicated for at least three days.
§ The last meal in every instance consisted of one-sixth of the daily diet.

CASE HISTORIES

The group of patients included two normal children (cases 2 and 10); one girl subject to cyclic vomiting (case 5) and one boy with diabetes mellitus (case 6). The histories of all but one of the children (case 10) have been recorded in previous papers of this series (case 2 in paper I,[14] case 5 in paper II [13] and case 6 in paper III [16]). The history of case 10 follows:

CASE 10.—M. Van der H., a girl, white, aged 9, came to the metabolism ward for observation on Nov. 5, 1925. Her past and family histories were irrelevant. Eight months before admission, a slight midline swelling in the lower part of the neck was noticed by the child's mother. No evidence of hyperthyroidism was detected, either while the patient was in the hospital or during the following nine months when she was observed in the outpatient department. The basal metabolism on two occasions was normal according to all standards. The child was essentially normal except for this slight enlargement of the thyroid gland.

RESULTS

Details of the calorimeter determinations appear in table 1. The first six observations have been grouped in pairs, in order to compare the results obtained while the patient was at rest with those obtained during the exercise. In each of the last four experiments in table 1 the metabolism of rest and the metabolism of moderate exercise were directly compared.

The basal metabolism in table 2 was made equal to 100 calories for purposes of comparison, and the metabolism during exercise was expanded proportionately. Column 9 gives the percentage increase in the total caloric output of exercise over rest. The experiments have been grouped in series in the order of the rise in heat production.

Respiratory Quotients.—The respiratory quotients during rest and exercise are given in columns 10 and 11 (table 2).

A. Controls: The two normal children (cases 2 and 10) who increased their total caloric output with mild exercise (by as much as 40 per cent in case 10) do not show a significant change in the respiratory quotient, the maximum change being ± 0.005.

B. Recurrent Vomiting: There was likewise not any appreciable change (± 0.005) in the girl who was subject to cyclic vomiting (case 5) in the two groups of observations, while on high fat and high carbohydrate diets.

C. Diabetes: Three observations were made on the diabetic boy (case 6). In the first two, his heat production increased 37 and 41 per cent with exercise. In neither of these was there a significant change

16. Levine, S. Z.; Wilson, J. R., and Rivkin, H.: The Respiratory Metabolism in Infancy and in Childhood: III. Glycogen Storage in Children, Am. J. Dis. Child. **31**:496 (April) 1926.

TABLE 2.—*Effect of Moderate Exercise on the Respiratory Quotient*

Case No.	Name	Activity	Exp. No.	Date	Calories per Hour*						Percentage Increase Total Output	Respiratory Quotient		Blood				Urine,† Acetone Bodies, Gm. per Hour	
					Rest			Exercise						Carbon Dioxide Content (Whole Blood per Cent by Volume)		Sugar (Whole Blood Mg. per 100 Cc.)			
					Protein	Fat	Carbohydrate	Protein	Fat	Carbohydrate		Rest	Exercise	Before	After	Before	After	Rest	Exercise
	(1)			(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
5	Nita H.	Rest	41	4/24/25	15.1	65.8	19.0	....	....	....	17.0	0.775	.....	....	....	.....	.....	0.1693	.....
		Exercise	42	4/25/25	....	....	....	16.2	79.8	20.8		.....	0.770	....	....	.....	.....	.....	0.1445
		Rest	51	5/13/25	11.5	43.3	45.2	....	....	....	28.0	0.845	.....	....	....	.....	.....	0	.....
		Exercise	36	4/15/25	....	....	....	13.7	54.9	59.6		.....	0.849	....	....	.....	.....	.....	0.0189
2	Esther F.	Rest	12	1/14/25	13.0	66.1	20.8	....	....	....	28.0	0.777	.....	....	....	.....	.....	0.1230	.....
		Exercise	7	1/ 3/25	....	....	....	19.6	81.6	27.1		.....	0.781	....	....	.....	.....	.....	0.0805
10	Margaret V. d. H.		67	11/27/25	14.7	61.7	23.7	14.7	87.4	37.9	39.9	0.788	0.793	48.8	42.7	73.6	66.4	0.0791	0.0791#
6	Fred A.		60	10/30/25	17.8	53.6	28.6	15.6	73.8	47.1	36.6	0.804	0.814	49.9	52.7	326.6	194.2	Faint tr.	0
			66	11/25/25	15.4	54.6	30.0	10.4	81.6	49.1	41.2	0.807	0.812	49.6	50.9	153.8	156.1	0	0
			61	11/ 4/25	19.3	51.8	28.9	16.3	104.1	31.4	51.7	0.807	0.775	47.6	50.3	192.4	101.5	Trace	Faint tr.

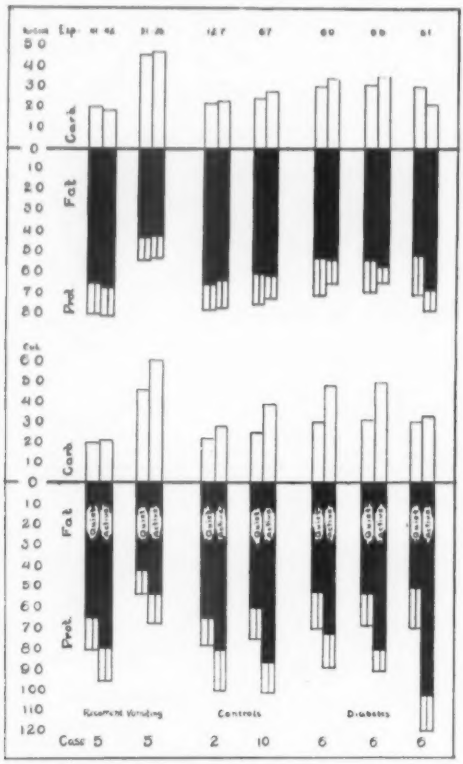
* The calories during rest have been made to equal 100, and the calories during exercise have been expanded proportionately for purposes of comparison.

† Sugar was absent in all calorimeter specimens except in case 6 (exp. 60), when 0.8 Gm. per hour was eliminated during the resting period.

Average of combined urine of rest and exercise.

in the quotient, + 0.01 and + 0.005, respectively. With more vigorous exercise, in which he increased his caloric output to 52 per cent, there was a fall in the quotient of 0.032.

Extra Metabolism Due to Exercise.—The method suggested by Hill [4] was used to calculate the extra metabolism due to exercise. It was assumed that the basal respiratory quotient did not change during short periods. The carbon dioxide produced and the oxygen consumed during rest were subtracted from the carbon dioxide produced and oxygen con-



The upper portion of the figure shows the percentage calories from protein, fat and carbohydrate utilized during rest and exercise. The lower portion of the figure shows the calories produced during rest and exercise when the resting metabolism is made equal to 100 and the exercise metabolism is proportionately expanded. Carbohydrate is represented by white and fat by black columns, the former being placed above and the latter below the base line in order that the relative amount of each may be readily compared.

sumed during exercise. The respiratory quotient of the extra metabolism due to exercise was calculated from the results (table 3).

The respiratory quotient of the extra metabolism is shown in column 11. In every instance the quotient is less than unity, that is, less than that indicative of pure carbohydrate combustion.

TABLE 3.—*Calculation of the Extra Metabolism Due to Exercise*

Case No.	Name	Date	Exp. No.	Duration Exercise Plus Subsequent Rest, Hour	Carbon Dioxide: Eliminated at Rest, Gm.	Carbon Dioxide: Basal for Exercise and Recovery (2 × 3) Gm.	Carbon Dioxide: Total Eliminated During Exercise and Recovery, Gm.	Carbon Dioxide: Due to Extra Metabolism of Exercise (5 — 4) Gm.	Oxygen: Consumed at Rest, Gm.	Oxygen: Basal for Exercise and Recovery (7 × 2) Gm.	Oxygen: Total Consumed During Exercise and Recovery, Gm.	Oxygen: Due to Extra Metabolism of Exercise (9 — 8) Gm.	Respiratory Quotient of Extra Metabolism Due to Exercise	Respiratory Quotient of Rest	Respiratory Quotient of Exercise	Diagnosis
	(1)			(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
5	Nita H.....	4/24	41													
		4/25	42	2.0	11.5	23.0	26.8	3.8	10.8	21.6	25.3	3.7	0.75	0.78	0.77	Recurrent vomiting
		5/13	51													
		4/15	36	2.0	10.9	21.8	28.1	6.3	9.4	18.8	24.1	5.3	0.87	0.85	0.85	Recurrent vomiting
2	Esther F.....	1/14	12													
		1/ 3	7	3.0	11.4	34.2	44.2	10.0	10.7	32.1	41.1	9.0	0.81	0.78	0.78	Control
10	Margaret V. d. H.	11/27	67	2.0	15.3	30.5	42.8	12.3	14.1	28.2	39.2	11.1	0.81	0.79	0.79	Control
6	Fred A.....	10/30	60	2.1	12.8	26.9	37.0	10.1	11.6	24.3	33.0	8.7	0.84	0.80	0.81	Mild diabetes
		11/25	66	2.0	12.4	24.7	34.9	10.2	11.2	22.3	31.3	9.0	0.83	0.81	0.81	Mild diabetes
		11/ 4	61	2.0	13.5	27.0	39.5	12.5	12.2	24.4	37.1	12.7	0.71	0.81	0.78	Mild diabetes

The respiratory quotient of the extra metabolism due to work approximated the respiratory quotient of the body at rest, except in one instance (experiment 61) in which the quotient was lowered with exercise, thus suggesting the possibility that fat may be burned directly, under stress.

It is interesting to consider the respiratory quotient of the extra metabolism due to exercise in the diabetic boy (case 6). The quotients decreased as heat production increased.

COMMENT

Technic and Methods.—Several points must be considered when an attempt is made to evaluate the reliability of these results:

1. Sources of Error in Technic in Exercise Experiments: Alcohol check experiments and repeated basal determinations on the same patient are generally conceded to be reliable controls of the accuracy of experiments in which the patient remains quiet in the chamber. Exercise experiments accompanied by added heat production require certain precautions. In these, the accurate measurement of the temperature of the chamber is important but difficult. This difficulty, however, is obviated by stopping the exercise for a sufficient time before the end of the period to allow conditions in the chamber to reach a "steady state." A method of controlling such difficulties was attempted by placing a heating pad in the chamber and varying the amount of current running through it during the course of alcohol check experiments. Thus it was possible to simulate the extra heat production of a patient during exercise. We believe that fifteen minutes is the minimum time during which the patient should remain quiet in the chamber before the end of the period. In actual experiments, however, exercise was stopped from thirty to twenty-five minutes before the end of the period.

2. Duration of the Recovery Phase and Methods of Checking: Researches of Fletcher and Hopkins [17] on surviving muscle, and later investigations of Embden,[18] Hill,[19] Meyerhof [2] and others, have shown that the normal chemical mechanism of muscular contraction is a breakdown of glycogen or of some other intermediary carbohydrate into lactic acid. On exertion, there is a rapid accumulation of lactic acid in the circulating blood resulting in a marked change in the acid-base equili-

17. Fletcher, W. M., and Hopkins, F. G.: Lactic Acid in Amphibian Muscle. J. Physiol. **35**:247, 1906.

18. Embden, G.: A Summary of Embden and his co-workers is reported by Schmitz, E. S.: Klin. Wchnschr. **1**:432 (Feb. 25) 1922.

19. Hill, A. V.: Die Beziehungen Zwischen der Wärmebildung und den in Muskel stattfindingen chemischen Prozessen, Ergebn. d. Physiol. **15**:340, 1916.

brium.[20] The presence of large amounts of lactic acid in the circulation is only temporary. Usually all of the excess lactic acid has disappeared [21] within an hour after vigorous exercise. Ryffel [22] showed that the amount of lactic acid was still increased forty-five minutes after a short period of vigorous exercise.

Hill, Long and Lupton [23] have studied the oxygen consumption and carbon dioxide output following periods of exercise and have plotted curves showing the respiratory quotient at various intervals after exercise. The respiratory quotient is high, especially just after severe exercise, quotients as high as 2 having been found. In the later stages of recovery, the respiratory quotient falls to low levels as lactic acid is removed from the circulating blood, and for considerable periods may remain below the value corresponding to the oxidation of fat. The chief sign, however, of the amount of lactic acid present in the body after exercise is the magnitude of the so-called "oxygen debt."

It is obvious even from this brief discussion that a certain amount of time is required for the body to resume its normal resting state. The violence and the duration of exercise affect the production of lactic acid in the body and modify the length of the period of recovery.

The increase in the lactic acid of the blood is reflected in a lowering of the carbon dioxide content. If the latter does not change in specimens of blood taken immediately before and immediately after the observation, it may reasonably be assumed that the period of recovery is complete. No appreciable change was found in a number of experiments (table 2, columns 12 and 13).

An added precaution consisted in using the average of at least two hourly periods for the computation of the respiratory quotient.

3. The Respiratory Quotient as an Index of Intermediary Metabolism: Certain theoretical objections have been made as to the use of the respiratory quotient in the calculation of the intermediary metabolism. The question has been discussed by various workers—Lusk,[5] Loebel,

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20. Barr, D. P.; Himwich, H. E., and Green, R. P.: Studies in the Physiology of Muscular Exercise: I. Changes in Acid-Base Equilibrium Following Short Periods of Vigorous Muscular Exercise, J. Biol. Chem. **55**:495 (March) 1923.

21. Himwich, H. E.; Loebel, R. O., and Barr, D. P.: Studies on the Effect of Exercise in Diabetes: I. Changes in the Acid-Base Equilibrium and Their Relation to the Accumulation of Lactic Acid and Acetone, J. Biol. Chem. **59**: 265 (March) 1924.

22. Ryffel, J. H.: Experiments on Lactic Acid Formation in Man, J. Physiol. **39**:29, 1909.

23. Hill, A. V.; Long, C. N. H., and Lupton, H.: Muscular Exercise, Lactic Acid and the Supply and Utilization of Oxygen, Proc. Roy. Soc., ser. B, pts. I to III **96**:438 (Sept.) 1924; pts. IV to VI **97**:84 (Nov.) 1924; pt. VII **97**:155 (Dec.) 1924.

Barr, Tolstoi and Himwich,[6] Richardson and Ladd [24] and Richardson and Levine.[6] We have assumed that the respiratory quotient furnishes a reliable index of the foodstuffs metabolized.[13]

Respiratory Quotient.—In these studies the effect of mild and moderate exercise on the respiratory quotient in normal children is negligible. In case 2 in which the patient fasted for thirty-seven and forty-one hours, the quotients of rest and exercise were almost identical. This was possibly due to the fact that at this time there was still a considerable reserve of available glycogen.[16]

Two observations were made on the girl who was subject to cyclic vomiting, and in neither was there a change in the quotient following mild exercise. In view of previous observations,[13] it would be interesting to know the effects of strenuous exercise.

The quotient did not show an appreciable change in the case of the boy with diabetes after moderate exercise, but it was lowered (0.032) after more vigorous exercise (experiment 61). This fall in the quotient is consistent with the recent observations of Richardson and Levine [6] and also with the earlier work of Salomon,[10] and of Grafe and Salomon.[11] On considering our alcohol checks and their results, the fall in the quotient of the diabetic boy is probably significant.

It also seems to be significant that the respiratory quotient of the extra metabolism due to exercise was in every instance less than unity. If these calculations may be relied on, they appear to furnish further evidence in favor of the belief of Lusk [5] and his co-workers that fat can be burned directly, under stress.

SUMMARY AND CONCLUSIONS

1. Two normal children, one subject to cyclic vomiting and one suffering from mild diabetes, have been studied in the respiration chamber during rest and exercise.

2. The similarity of respiratory quotients during rest and during mild and moderate exercise indicates that the proportions of fat and carbohydrate burned by normal children do not vary appreciably.

3. The proportions of foodstuffs burned during rest and during mild exercise similarly do not show an appreciable difference in a girl subject to cyclic vomiting and in a boy who suffered from mild diabetes.

4. In one experiment, with more vigorous exercise, the respiratory quotient of the boy with mild diabetes was lowered. This suggested an increased combustion of fat when compared with the amounts used during rest.

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24. Richardson, H. B., and Ladd, W. S.: Clinical Calorimetry: XXXIV. Ketosis and Respiratory Change in Diabetes, J. Biol. Chem. **58**:931 (Jan.) 1924.

5. The respiratory quotient of the extra metabolism due to exercise, as calculated by the method suggested by Hill, was in every instance less than unity; that is, less than the respiratory quotient obtained with the combustion of pure carbohydrate.

6. From the observations recorded, it may be tentatively concluded that children with mild diabetes may be permitted restricted muscular activity without fear of increasing ketosis. There is, however, some danger in permitting unlimited activity.

7. Further work is planned in which the effect of strenuous work on the respiratory quotient of normal children will be compared with that of children subject to cyclic vomiting.

PROGRESS IN PEDIATRICS

GONORRHEAL VULVOVAGINITIS IN THE YOUNG

HISTORY, PREVALENCE, TREATMENT AND CASE REPORTS *

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In order to understand gonorrheal infection in the young, it must be stated that though it is described for the sake of convenience as it appears in men, women and children, the same process underlies the subject as a whole.

Children, as will be seen later, become infected through indiscriminate contact with adults. For this reason it is intended to show briefly that history is rich in examples of how gonorrhea affects first man, then the child.

HISTORY

The exact period at which gonorrhea began to affect mankind is unknown. It was well known and prevalent among ancient civilizations. In classic writings as early as 300 B. C., there are constant references to it, by such men as Hippocrates, Aristotle, Seneca and Plato. It was known to the ancient Hebrews. In the book of Leviticus xv, 2 and 3 (about 1490 B. C.) is this passage: "Speak unto the children of Israel and say unto them, when any man hath a running issue of his flesh, because of his issue, he is unclean." That Moses fully appreciated the contagious nature of the disease is shown by the nature of the special directions he gave with reference to articles of food and clothing. It is known from the many descriptions that the ancient Egyptians were familiar with gonorrhea. Then, too, the writings of Celsus show that it was common in ancient Rome. About 70 B. C., Posidonius notes of Cleopatra [1] that she was known to have written on gonorrhea and diseases of women. It was not until the tenth century, with the writings of Avicenna, that there was any suspicion that the disease was of inflammatory nature. Maimon (1240 A. D.) first recognized that the discharge was different from semen. At a later date (1500 A. D.) the disease became confused with syphilis, and the matter was not settled until 1831, when Ricord made 667 inoculations and showed conclusively

* Received for publication, Dec. 27, 1926.

* From the Department of Gynecology, Georgetown University.

1. In Baa's History of Medicine.

that the two diseases are distinct. This confusion lasted from 1493 to the middle of the last century. Even Paracelsus was under the misconception, and in 1530 enunciated his doctrine that gonorrhea is the initial symptom of syphilis. In 1767, the famous John Hunter performed an experiment to clear up the controversy. He inoculated himself with the pus from a case of gonorrhea, but unknown to him the patient also had syphilis.[2] Four or five days afterward he developed gonorrhea and eventually a chancre. He concluded that the poison was the same for both. It was left for Benjamin Bell to demonstrate the duality of the two diseases by inoculating two of his students. Following the researches of Bessereau, in the early part of the nineteenth century, Ricord (1837) commenced the work which in 1860 resulted in complete proof that the two diseases were distinct. Bacteriologic proof was wanting until Neisser of Breslau (1879) discovered the gonococcus and gave the disease the name of gonorrhea. This proved to be one of the great achievements of scientific medicine.[3]

PREVALENCE

To determine exactly how prevalent gonorrhea in the young is in this country, one must have recourse to statistics. This was found to be almost a hopeless task, as registration of morbidity in the United States is still lacking. It must be recognized that, though in its infancy, real steps forward are being made by every state in the Union, under the leadership of the United States Department of Public Health, in reporting these cases. Many of the figures here published were obtained from literature of the Venereal Division of the United States Public Health Department[4] and from the Statistical Division of the Surgeon General's Library. Realizing the limitations of figures, I have restricted myself to such cases as have been reported from time to time by various authorities and to estimates of the United States Public Health and hospital dispensaries. Figure 1 indicates how prevalent the disease is among the general population. This is based on the United States Public Health records of cases for 1919-1925.

It might be of interest to note the seasonal variations, as reproduced in figure 2.

Figure 3 endeavors to show the age distribution in female gonorrhea, based on 800 clinical cases (United States Public Health).

In regard to color, attention is invited to a curve printed by the Michigan Department of Health (fig. 4).

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2. Garrison: History of Medicine, ed. 3, p. 355, 1924.

3. Garrison: History of Medicine, ed. 3, 1924.

4. Public Health Reports, January, 1918, 1 to 3; June, 1918, p. 1055; P. H., December, 1920, p. 3091.

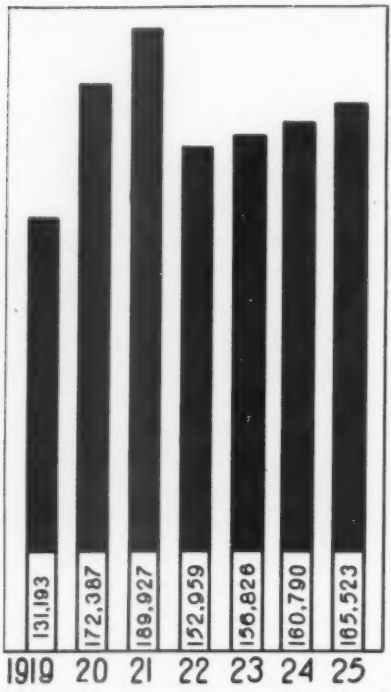

Fig. 1.—Cases of gonorrhea reported to state boards of health by years.

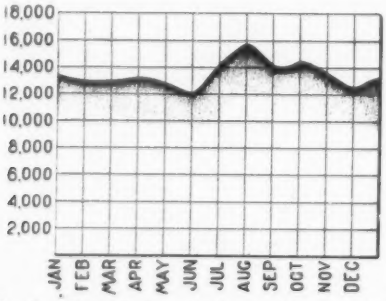

Fig. 2.—Seasonal variations of gonorrhea.

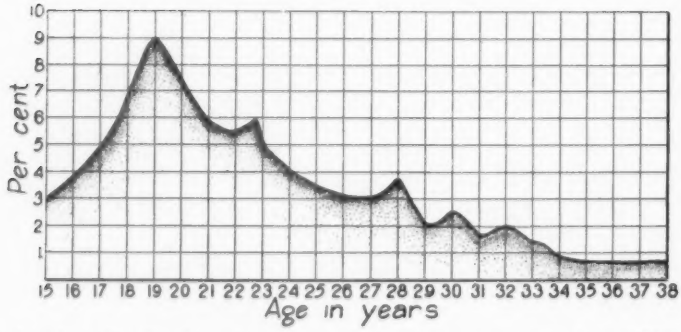

Fig. 3.—Age distribution of venereal disease in women, based on 8,000 clinical cases.

Up to the fifteenth year, the negro curve is continuously above the white, after which it drops below. The notable increase between 5 and 9 years would seem to indicate the prevalence of insanitary conditions resulting in innocent acquirement.

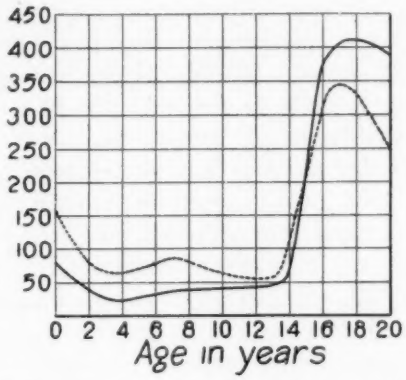

Fig. 4.—Michigan Department of Health: Venereal disease. Relative variations between white and negro females by ages of reported cases of gonorrhea.

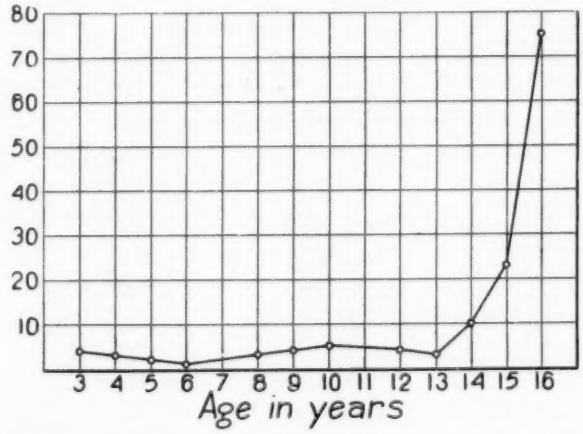

Fig. 5.—Relative variations in the incidence of gonorrhea in the District of Columbia dispensaries according to age.

In this connection, it must be said that gonorrhea outranks a large majority of contageous diseases in children, running second to measles and outnumbering smallpox and scarlet fever.

As regards mortality, the number of deaths ascribed to gonorrhea is small. In 1919, only 621 deaths were reported in the United States. Gonorrhea, therefore, is not a killing disease.

Considering prevalence in regard to classes of society, Fraser aptly states that in Europe the disease is most prevalent among the poor, while in South Africa it is as frequent in the well-to-do as in the middle classes. During 1925, 304 cases from various hospital dispensaries of the District of Columbia were reported to me. The youngest age was 3, and the oldest 16 years. Figure 5 illustrates the age distribution of cases reported by the various hospital dispensaries of the District of Columbia.

A. Reith Fraser [5] reported incidents by various authors as early as 1877. He states that Romniceau and Robin, in 1901, found gonorrheal infection among 600 children admitted to the Babies' Hospital in New York. Holt [6] states that there were sixty-five cases of vaginitis in the same institution in 1903. Of these, six of the patients were suffering from ophthalmia and twenty-six with acute arthritis. Other large institutions like Mt. Sinai report epidemics occurring from time to time. In the latter institution, 190 children were infected with gonorrhea.

On the other hand, Morrow and Bridgman [7] stated that 55 per cent of female children admitted to the State Training School at Geneva, Illinois, were found to be suffering from gonorrheal infection. In the clinic of Kidd and Simpson, in London, in 1924, 8 per cent of their cases were gonorrheal infections in children.

It is estimated that from 2 to 10 per cent of young girls in institutions suffer with gonorrhea. Even higher estimates are noticed in cases referred to the clinics at Georgetown and Columbia Hospitals by the Board of Children's Guardians. In the large clinic of Van Der Reyden (Amsterdam) 1,300 young girls were affected with the disease during 1924. The Vanderbilt clinic, for example, treated 344 patients, the average age being 5.1 years; the youngest was 3 weeks old and the oldest 12 years. Pollack, in 1911, reported that between 800 and 1,000 children are infected annually in the city of Baltimore. In the state of Indiana, King and Sydenstricker [8] report 262 patients up to the age of 16, while in the state of Michigan, Deacon reported 610 patients up to the age of 15.

It would of course be possible to develop an index of the prevalence in the United States, if every physician was willing to report his series of gonorrheal cases. Incidentally, a better plan could not be formulated than to obtain the services of the social welfare workers and visiting nurses' societies in popularizing the reporting of all venereal diseases.

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5. Fraser, A. R.: M. J. S. Africa **21**:31 (Sept.) 1925.

6. Holt: Diseases of Infancy and Childhood, ed. 7, p. 656.

7. Morrow, Louis, and Bridgman, Olga: Gonorrhea in Girls, J. A. M. A. **58**:1564 (May 25) 1912.

8. King and Sydenstricker: Public Health Reports, December, 1920, pp. 3091, 3107.

MODE OF TRANSMISSION

It is a universally accepted fact that minors are infected through contact with adults. A hard and set rule cannot be attributed to any one focus of infection, yet it is well known that dissemination usually arises by means of clothing, communal towels, diapers, baths, thermometers, sponges and innumerable other household materials. Rape and sexual

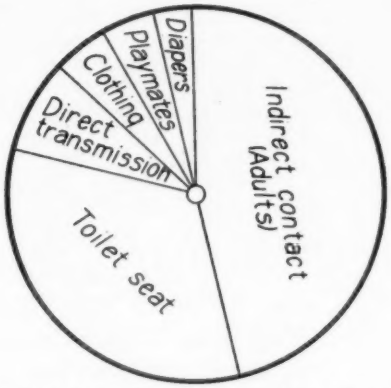

Fig. 6.—Modes of infection according to private practice of physicians.

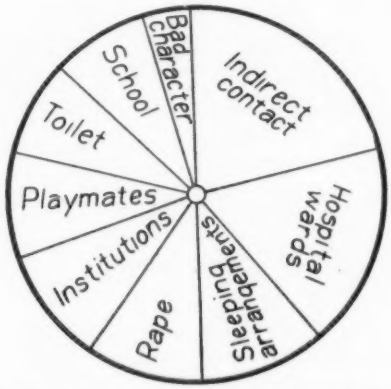

Fig. 7.—Modes of infection according to social welfare workers and visiting nurses.

contact are not infrequent modes of transmission. Probably the chief disseminator is the common toilet seat. To indicate the variability of the modes of infection, the following cases are taken for illustration, from the Georgetown University Hospital Dispensary:

J. W., aged 2, colored; infection likely from older boy in the family, suffering from gonorrhea.

M. R., aged 3, colored; infection traced to older sister.

E. S., aged 4, white; infection from a nurse-maid. The latter was under treatment in the same clinic.

D. P., aged 7, colored; due to sexual contact; superstition, desiring cure through contact with inmmature vulva.
M. T., aged 9, colored; criminal assault.
L. F., aged 10; unknown.
M. E., aged 13; sexual intercourse.

Figures 6 and 7 illustrate various methods of transmission, based on a series of cases reported by physicians for the American Pediatric Society, and that of social welfare workers and visiting nurses' societies in dispensaries.

In institutions, the disease is most often acquired through diapers. Other possible sources of contagion are towels, sponges, bed-linen, thermometers, syringes, bathtubs and bath water.

With regard to direct contact, rape constituted about 7 per cent of the series. A horrible way of transmitting the disease mentioned by Norris,[9] Watson [10] and Lees [11] is the superstition that prevails amongst the ignorant that sexual contact with a young female child will insure the cure of gonorrhea in the male. Incredible as this may seem, Seippel,[12] in 1912, examined fifty-three girls, most of whom were attacked as a result of this superstition. Pollack states that many of the children thus infected do not show evidence of rape, the infectionist not desiring coitus.

NATURE OF THE GONOCOCCUS

Until recently, gonorrhea was thought to be confined exclusively to the human race, not even the anthropoid apes being included. Kinsella, in an unpublished communication in 1925, has made laudable progress toward the production of experimental gonorrhea in animals, a feat hitherto unaccomplished. The micro-organism was first successfully cultivated in 1885 by Bumm, who used human blood serum for his medium.

The micro-organism is familiarly known as a bean-shaped diplococcus. These diplococci are found grouped in pairs, fours and other multiples of two, each time showing a predisposition to rectangular formation. The most favorable medium for growth is the alkaline human blood serum. It is nonmotile, does not produce spores and is a facultative anaerobe. Both living and dead gonococci contain toxic substances.

The most frequent organism with which it is confused is *Micrococcus catarrhalis mucosus*. It can be excluded, however, by the cultural characteristics, in that the gonococcus ferments glucose and maltose. The meningococcus and certain chromogenic cocci have been, at times, mistaken for it. In many situations, the gonococcus can be differentiated

9. Norris: Gonorrhea in Women, 1913, p. 376.
10. Watson: Gonorrhea and Its Complications, London, 1914, p. 285.
11. In Thompson's Gonorrhea, 1923, p. 473.
12. Seippel: Illus. M. J., 1912, p. 50.

only by the complement-fixation test. This, fortunately, is not often the case. It must be borne in mind that there are various strains of gonococci existing. Torrey,[13] for instance, was able to reproduce eleven different strains. Pearce,[14] on the other hand, states that these strains are not as clearcut and as easily distinguished as would be supposed. Some claim that there exists an "adult" and "infant" type, yet morphologically and culturally these seem to be identical.

A variety of gonococcus has been reported by Kahn[15] called the pseudo or paragonococcus. Tsoumaras, in an unpublished communication in 1925, claims to have found this organism. Gonococci sometimes appear in granular or "involution" forms.

Factors that promote growth in as well as outside of the human body are moisture, temperature, contusion and intimate contact.

Eyre[16] states that of the many types of gonococci, there are three main varieties: The first is that obtained from ophthalmia neonatorum and from the gonorrheal conjunctivitis of the adult. The second type is one recovered from joint fluid. The third type is found in acute genital gonorrhea. The last mentioned is considered highly parasitic.

Dry materials, as a rule, do not transmit the gonococcus. At room temperature, the gonococcus is known to have retained its activity outside the human body or the incubator as long as eight hours. Some claim it to have lived on linen as long as forty-nine days.

Heiman[17] has claimed to have cultivated the gonococcus from a thick drop of pus 29 days old.

The gonococcus is not resistant to the action of germicide, as seen in the accompanying table of Oppenheimer.

Minimal Strength of Gonococcides According to Oppenheimer

Phenolized oil	1:10	Copper sulphate	1:20
Phenolized glycerin	1:25	Potassium permanganate	1:20
Zinc sulphate	1:20	Phenol (carbolic acid)	5:100
Thymol	1:20	Silver nitrate	1:50
Salicylic acid	1:20	Bichloride of mercury	1:20,000

From the practical point of view, since many micrococci resemble the gonococcus morphologically, it becomes necessary to differentiate them. So far, there are three main methods at one's disposal:

First is the microscopic examination. Here it is seen appearing as a bean-shaped diplococcus, occurring in pairs or in groups. One also can notice if it is intranuclear or extranuclear and intracellular or extracel-

13. Torrey: Immunial Balt. **4**:305, 1922.
14. Pearce: J. Exper. Med. **21**:289, 1913.
15. Kahn: Arch. f. Gynak., 1925, p. 121.
16. Eyre: Brit. J. Venereal Dis., 1925.
17. In Keyes' Urology, 1921, p. 111.

lular. In this respect, to quote the eminent authorities Park and Williams, before the discharge becomes purulent the gonococci are found mostly free in the serum, or they may be plastered on epithelial cells; later they are found in or on pus and epithelial cells and always appear extranuclearly.

Second, one observes it to be gram-negative. It is possible to make an interpretation from these two features alone, for experience has taught that a clearcut clinical history and organisms having these two characteristics prove for all practical purposes the presence of gonococci. Under doubtful circumstances the second means of differentiation can be relied on, i. e., the growth of the micro-organism on proper culture mediums. Briefly, the method pursued in most laboratories is as follows: A smear of the discharge is made over ascitic agar (one to four plates) containing 2 per cent glucose. After twenty-four hours' incubation at 36 C., the plates are examined for colonies. A smear is made from the most characteristic colony and stained by Gram's method.

The third means of differentiation is the complement-fixation test. Its greatest use, however, is made in chronic cases and also for the determination of a cure. The method of Müller and Oppenheim is the one most frequently used. For procedure and technic of this test, a text must be referred to. This much can be said of the test, that a positive reaction is an indication of the presence or recent activity in the body of a focus of living gonococci. This may persist from six to eight weeks after a cure has been affirmed. Persistently negative results indicate the probability of a cure.

PATHOLOGY

The vaginal canal in childhood does not have the same protective functions that it takes on in later life. The labia are small and gaping, so as to expose the vestibule freely, the urethral orifice and the vaginal tract particularly. Then again, it frequently harbors such bacteria as the bacillus of Doederlein, the staphylococcus, streptococcus and *B. coli communis*. Some authorities contend that gonorrheal infection in the young is different from that occurring in the adult. Whatever the view, clinical experience shows that the gonococcus recovered in the majority of cases of vulvovaginitis in children proved less virulent than the micro-organism seen in the adults. For example, there is a noticeable absence of constitutional symptoms, and complications are not as frequent. The outstanding feature in these cases is that the inflammatory process is a general one, involving almost simultaneously the vagina, hymen, urethra, cervix uteri and sometimes the anal orifice. It is a frequent observation that when the cervix is affected, it usually suffers the brunt of attack, because of its moisture and the lymph spaces and innumerable tubular glands lining it. Once the gonococcus has invaded these glands, every

resource in the treatment may fail to dislodge it. Viewed through a small speculum or urethroscope, the cervix is found to appear edematous and hyperemic, and the exterior is covered with mucopurulent discharge. In severe cases ectropion may occur. The inflammation may take an ascending course, in which event it sets up an inflammation in the endometrium, then eventually reaches the tubes and ovaries. Luckily, nature tries to limit this infection by sealing up the fimbriated ends of the fallopian tubes. When this fails to occur, as it does in about half of 1 per cent of the cases, peritonitis follows. It is interesting to note that though this complication is infrequent in the child, Noeggerath claims that from 80 to 90 per cent of pelvic inflammatory diseases were gonorrheal in origin in the adult. The process is usually bilateral.

Most frequently, the gonococcus first develops on the mucous membrane. Infiltration with serous exudate and accumulation of leukocytes follows. Then the bacteria penetrate the epithelial layer down to the submucosa. From this point, recovery or chronic inflammation follows.[18]

Because of its anatomic construction, the vagina is not susceptible to catarrhal inflammation. Maier and Taussig assert that when infection takes place it is because the pavement epithelium in early life is soft, smooth and tender, resembling more the columnar type of epithelium. The inflammation in the vagina is general, involving the entire tract. Some authors claim that gonorrheal vaginitis in early life may cause adhesions of the vaginal walls, so as to cause atresia.

SYMPTOMS

The acute type is the one most commonly encountered in gonorrheal vulvovaginitis. At times it may be so mild as to escape notice, but in most instances the symptoms are distinctive. At first, there is itching and burning and some complain of a sensation of "weight" in the genital tract. This is probably due to the edema present. I always found ardor urinea an early and a troublesome symptom. There is pronounced redness and edema of the external genitalia, the hyperemia extending to the inner sides of the thighs. The labia majora are swollen and coapt, with gluing occurring at first, followed by a thin, watery discharge. As the disease progresses, the discharge changes its character from watery to cream-like consistency, and later assumes a greenish-yellow color. The odor becomes offensive, the result, no doubt, of increased sebaceous secretions. A mild fever generally accompanies this stage, but as a rule goes unnoticed.

These acute symptoms usually subside in from three to six weeks. Some authorities, like Norris, give much higher figures. When a cure

18. Adami and McCrae: Textbook of Pathology, ed. 2, p. 205, Philadelphia, Lea & Febiger, 1914.

has been effected, the discharge becomes thinner and serous in character, and finally disappears, as do the pain and other disturbing symptoms. On the other hand, if the progress of the case has been handicapped by failure to carry out instructions or lack of proper treatment, chronicity results.

The chronic stage is characterized by a continued discharge and loss of weight. The child becomes irritable and refuses food, the latter causing marked emaciation. It is during this stage that many complications occur, no doubt the result of general invasion as well as of carelessness on the part of the patient.

DIAGNOSIS

It is a recognized fact that the microscope is the essential part of every diagnosis. Without its use little advance could be expected. In diagnosing a case microscopically, great weight must be attached to the manner in which a smear is made.

First of all, the glass slides must be clean and sterile. With the aid of a nurse (the patient being in lithotomy position) the labia are held wide apart and a small sterile cotton swab or a platinum loop is used, to obtain sufficient discharge to make two thin smears on two separate slides, one smear from the vulva and another from the vagina. The manner in which a smear is made of the vaginal walls and of the cervix is important. With the labia well dilated, the swab is introduced in the vaginal orifice without touching the labial folds. Then it is rubbed gently about the vaginal walls and withdrawn in the same manner and the smear made. When it is desired to obtain a smear of the cervix, a sterile speculum is used, preferably the smallest Graves or else a dilatable, female urethroscope, and this is cautiously introduced into the vagina. After any plaques of pus that may surround the cervix are wiped away, the swab is introduced into the external os and the third smear made. This is sent to the laboratory to be stained by Gram's method.

When the diagnosis is to be made from the microscopic examination alone, the Medical Research Committee of 1918 formulated these postulates: First, the clinical history and appearance must be that of gonorrhea; second, proper technic must be observed; third, the person examining the films must be experienced; fourth, in doubtful cases, other methods must be resorted to, such as cultural characteristics, skin reaction, or complement-fixation tests.

Since mention is made of the skin reaction test, this much can be said of it, when a diagnosis from it alone is desired: First, it is positive in 38 per cent of nongonorrheal cases; second, the readings of the result of reaction must be subject to the examiner's personal impression. A word might be said in this connection about the use of the complement-fixation test. The chief use of it is in diagnosing long standing cases or in determining a cure. A positive reaction persists as long as there is any active gonorrheal infection present in the patient's body. Thus, a persistent tubal or arthritic infection may keep up a positive reaction

after all local manifestations have disappeared. It must not be forgotten that, as with the skin reaction, the interpretation depends solely on the one performing this test. However, the practitioner will be wise to rely more on this test than on any other.[19]

In differential diagnosis, the two most common infections with which gonorrheal vulvovaginitis is confused are:

Simple Vulvitis.—This presents the same clinical symptoms, but the infection is generally of a shorter duration and is milder in character; bacteriologic examination generally clears up the controversy.

Diabetic Vulvitis.—This is not frequent, but when present it produces some troublesome symptoms. It can be ruled out by chemical examination of the urine.

Wobus calls attention to a third frequently encountered infection—that produced by the nonpathogenic pseudogonococcus. Cultural methods must be used to differentiate this form of vulvovaginitis.

Concerning a cure of gonorrheal vulvovaginitis, most authorities agree that a cure can be had, under skilful directions. The concensus is that a cure can be established, provided the following criteria are used:

1. The disappearance of all subjective and objective symptoms.
2. Negative smears in repeated microscopic examinations.
3. A negative complement-fixation test.

Duken, on the other hand, suggests provocative tests before the dismisal of a patient as cured.

Stein [20] determines a cure on the following criteria:

1. Disappearance of all clinical evidence.

2. Three negative smears, at intervals of one week after suspending treatment, followed by a period of observation equal in time to the duration of treatment.

PROPHYLAXIS

Mothers often come to the clinic desiring information on the prophylactic treatment. Most authorities do not recognize this treatment, but what is ordinarily called prophylactic treatment simply means early treatment. The following technic is generally employed:

1. The external genitalia are washed briskly with soap and water, or with boric acid solution.

2. This is followed by a bactericidal douche consisting of 1:2,000 mercuric chloride solution or 1:4,000 potassium permanganate. Then with the patient still in a lithotomy position, a 10 per cent solution of

19. Keyes' Urology, 1921, p. 194.
20. Stein, I. F.: Surg. Gynec. Obst. **36**:43 (Jan.) 1923.

protargin mild solution is introduced into the vagina by means of a catheter and funnel.

Experience compels me to state that the outstanding feature in prophylaxis is education. All persons that come in contact directly or indirectly must be made acquainted with the disease. The physician should be the leader in every movement of education, in civil activities as well as in private practice. The mother, the nurse and the teacher should be especially well informed about the contagiousness of the disease. Likewise, prevalence and mode of infection should be strongly emphasized. In this clinic, through the cooperation of the National Catholic Welfare Service School and the District Nurses' Visiting Society, my associates and I are constantly informed relative to conditions prevailing in the home. We look to the mother as the sine qua non in carrying out home treatment and principles of prophylaxis. As regards home hygiene and personal prophylaxis, the child is advised to sleep alone in every instance. She should be made to wear a vulvar pad at all times. She is not permitted to mix freely with playmates, but must be restricted to the sick room. After each use of the toilet, the child's hands must be washed and cleaned with bath alcohol. This, of course, is a tedious task, especially in crowded surroundings. The mother is cautioned that clothing and the infected child's bed linen must be washed in a separate laundry. It is suggested that clothes should first be saturated in a bichloride of mercury solution (1: 50,000), followed by boiling from one-half to one hour. This is an extra precaution to insure sterilization. The seat of the toilet, when occupied by the infected child, should be protected by a towel, followed by washing with 1 per cent compound solution of cresol or creolin solution. All toilet utensils, such as douche pans and irrigating tips, should be cleansed and sterilized. It must be remembered that strict isolation is not always possible. This is especially true among the poor and such patients as visit free dispensaries for treatment. Under these circumstances, the best thing one can do is to insist on the measures here mentioned (which is not all that can be said on the subject) and to remind the mother constantly that complications arise if the rules of treatment and prophylaxis are not lived up to rigidly. Hospitals have a three-fold problem to contend with: First, the prevention of cases entering its wards unrecognized; second, the establishment of outpatient departmental clinics in which these cases may be handled properly, and last, if a case should develop in the hospital, absolute isolation of the patient and articles pertaining to the patient.

TREATMENT

In treating gonorrhea, it must be remembered that the successful handling of the case depends not so much on the medicant used as

on the method pursued. The earlier a patient is seen, the better are the chances for a cure. Few diseases in the realm of medicine have been subject to such a great variation in treatment and medicines employed. From the earliest cases on record, each man had his own particular way of treating the disease. For instance, as early as 59 B. C., Cleopatra was supposed to have prescribed for ulcers of the vulva as well as for gonorrhea. It is interesting to note such constituents as arsenic, elaterium, sulpher and burned paper, 6.6 Gm. of each, to be rubbed together and applied as a pessary.[1] In the Middle Ages, though the treatment of gonorrhea is not alluded to specifically, without a doubt it took on an aspect similar to the prevailing belief of that period. Thus, alchemists searched for the philosopher's stone that would cure all diseases. The school of Paracelsus in the fourteenth century insisted on the mystical virtues of antimony, arsenic and silver. The last named is extensively used at the present day, as will be shown later. In the early part of the eighteenth century, the teachings of Hahnemann stood forth preeminently. The principle use of his doctrine, however, has been to show rational medicine the fact that some of the diseases lead to recovery without any medical intervention.[21] During the latter part of the nineteenth century, systemic treatment for gonorrhea was in vogue. Silver was the only drug used locally. Its use originated with Carmichael and Wallace in 1833. Haunay, in 1844, and Ricord, in 1850, stand on record as using silver nitrate, 1 per cent. Simpson, in 1850, was one of the first to adopt systemic as well as local treatment. Internally, he [22] advised mercury with chalk and frequent ablution with milk or water locally. Schmid, in 1880, practiced filling the vaginal tract with a powder containing salicylic acid. This was allowed to remain undisturbed for about a week. Crede, Fehling and others tried the same method in puerperal infection. Emmett, in 1884, advanced the method of cleansing douches and tampons. In 1885, Sänger used iodoform packing. These packs remained in the vagina for two or three days. Taussig objected to the use of irrigation and instead used a 25 per cent solution of protargin mild solution [23] in acute cases for the first four weeks. Of the more modern authorities, Crossen, for example, uses a 1 per cent silver nitrate solution once daily, increasing the strength to 2 per cent. A solution as high as 5 per cent can be used in chronic cases. Millstone [24] instils a 50 per cent solution of peroxide, followed by an injection of 2 drams (7.8 Gm.) of 1 per cent yellow mercuric oxide.

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21. In Sollman's Pharmacology, p. 70, Philadelphia, W. B. Saunders Co., 1918.
22. Simpson: 1850 Lecture Series.
23. Taussig: Am. J. M. Sc. **48**:480, 1914.
24. Millstone: New York M. J. **105**:451, 1917.

McKelvy of Colorado State Venereal Clinic advises daily instillation of some gonococcide, with frequent cleansing as the best form of treatment.

Host maintains that local cleanliness is the first requisite followed by irrigations of bichloride of mercury 1 : 10,000 or potassium permanganate 1 : 2,000. After irrigations, a local application of 10 per cent silver nitrate is made.

Dorne and Stein [25] recommend an ointment of equal parts of hydrous wool fat and petrolatum, with 1 per cent mercurochrome-220 soluble. Patients have been cured in 9.7 weeks with this method.

Gellhorn [26] asserts that by use of 1 per cent silver nitrate in petrolatum better results are obtained, as the material stays in the vagina. The average duration of treatment was from three to four weeks.

Norris and Mikelberg [27] use an oily surgical solution of chlorinated soda (Dakin's solution), 1 part to 99 parts of olive oil. Three ounces (85.05 Gm.) are placed in the vagina morning and evening. The external parts also are washed with it.

Elmergreen, in his series of cases, reports good results from copper citrate ointment (5 per cent), used once daily.

Larson of the University of Minnesota finds certain chemicals destroying the gonococcus by liberating nascent sodium from bacterial bodies, a substance of high germicidal value.

Hagen [28] used 10 cc. injections of sterilized cow's milk every three or four days. Urticaria and the formation of abscesses were frequent complications.

Walther and Peacock [29] treated thirty-eight patients with diathermy. A voltage not less than 35,000 and a frequency of 2 million per second were used.

Fraser suggests a culture growth of *B. bulgaricus* in cases in which vaginal mucosa must be returned to normal. The vagina is thickly smeared with this preparation every two or three days. Among other remedies tried for specificity were autoserums, intravenous gonococcal vaccines,[30] picric acid, flavine and methylene blue.

Davis of the University of Nebraska in an unpublished communication in 1926 stated that he tested 204 remedies, hoping to find in them an efficient urinary antiseptic. He reports one of the dyes as repeatedly clearing the urine of gonococci and pus. Among the dyes tried, acriflavine is reputed to be the best.

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25. Dorne and Stein: Illinois M. J. **45**:219 (March) 1924.
26. Gellhorn, G.: Treatment of Vulvovaginitis in Children, J. A. M. A. **75**: 1647 (Dec. 11) 1920.
27. Norris and Mikelberg: Arch. Pediat. **39**:281 (May) 1922.
28. Hagen: Dermat. Wchnschr. **81**:1107 (July) 1925.
29. Walther and Peacock: New Orleans M. & S. J. **78**:213 (Oct.) 1925.
30. Culver, H.: Gonorrhea, J. A. M. A. **68**:362 (Feb. 3) 1917.

Hinman finds the antiseptics of the aromatic series the best. Drugs that have been given repeatedly by mouth are oil of santal, copaiba, methylene blue and hexamethylenamin-tetramine.

Physiotherapeutic measures, too, have been tried. The dry treatment, for instance, introduced by Englemann of St. Louis consists of drying the parts after using a cleansing douche. Then, bismuth subnitrate with equal parts of prepared chalk are introduced into the vagina. A tampon prevents the escape of the drug and the discharge. The same is repeated in from twenty-four to forty-eight hours.

The hot air treatment, too, is highly recommended. Briefly, it consists of a cleansing douche, and of drying all parts by means of a dentist's hot air bulb. Graves follows this with liberal painting of the vagina and vulva with 1 to 2 per cent solution of mercurochrome-220 soluble.

There is still much difference of opinion as regards the use of vaccines. The prevailing attitude is that the same results are obtained from autogenous as from the stock vaccine. Another feature to bear in mind is that in vaccine treatment, one patient reacts to it differently than another. The usual dosage for children should be small at first (about 1 million gonococci to the injection). This is repeated every four or five days. Mixed vaccines are recommended in symbiotic infections. Some claim that detoxicated vaccines are especially beneficial in secondary infections, such as urethritis or bartholinitis. The systemic treatment, once the sole practice of our fathers, has taken a secondary place in modern therapy. Today, more stress is laid on rest, hygiene, diet and local treatment. As regards rest, it can be stated safely that not any other measure contributes so largely to an early recovery and is a better protection against complications. The diet in acute cases should be simple and generally of a low protein content. Fruit juices and toast and cream are beneficial and are favored by children. From the hygienic standpoint, free intake of fluids should be insisted on, and if necessary, saline purgatives should be recommended daily. It is claimed that an acid condition of the urine tends to safeguard against cystitis.

In the local treatment it must be reiterated that gentleness is the keynote to success. The following procedure is recommended: With the child in the sacrodorsal position, the genitalia are washed either with soap and water, or with a mild solution of boric acid. Then by means of a soft rubber catheter, 1 ounce (28.35 Gm.) of 25 per cent solution of protargin mild solution is introduced into the vagina and kept there approximately four or five minutes. The vulva is then freely painted, with either protargin mild solution or mercurochrome-220 soluble. This is repeated daily by the visiting nurse. Between treatments, I prescribe a 20 per cent protargin mild solution suppository, one in the morning and one at bedtime. The mother can be entrusted with the latter part of the treatment.

CONCLUSION

1. Vulvovaginitis in the young results from indiscriminate contact with adults.

2. On account of the extreme contagiousness of the disease, it is difficult to control.

3. The microscope is the essential part of every diagnosis.

4. The attitude of the physician should be one of help and education.

5. Successful results depend not so much on the kind of medicant used as on the method pursued.

6. Daily instillation of some form of a gonococcide by the physician or nurse and frequent cleansing by the mother are the best forms of treatment.

News and Comment

AN INTERNATIONAL CONGRESS FOR CHILD PROTECTION

An International Congress for Child Protection is being organized by the League of Red Cross Societies, the International Association for the Promotion of Child Welfare, the International Union for the Protection of Infants, and the Save the Children Fund International Union, and will be held in Paris, July 2 to 5, 1928 (*Rev. internat. de l'enf.* **3**:33, 1927).

The meeting will be held in connection, first, with the International Congress for Relief, which will take place at Paris (July 5 to 8), and second, with the International Conference on Social Service (Paris, July 8 to 13, inclusive). During the congress the International Association for the Promotion of Child Welfare will hold its seventh session, and the executive committee of the International Union for the Protection of Infants will meet. The members of the three congresses will meet at the Sorbonne on July 8.

The following is a list of the officers of the congress:

Chairman, M. Paul Strauss, senator, former minister of health, public assistance and social welfare.

Secretary-General, Dr. Lesage, secretary-general of the "Comité national de l'enfance."

Treasurer, M. Lenoir, treasurer of the "Comité national."

Secretaries, Mlle. Gros, secretary-rapporteur to the "Conseil superieur de l'assistance publique"; Dr. Cruveilhier, assessor to the "Conseil superieur d'hygiene publique de France," Member of the "Conseil superieur de l'assistance publique."

Officers:

1. League of Red Cross Societies: Dr. Humbert, director of the health section; Dr. Djerkowski, member of the health section.

2. International Association for the Promotion of Child Welfare: M. Rollet, representing the chairman, Marquis Paulucci di Calboli; M. Deredu, senator, former minister of health, public assistance and social welfare, president of the French section of the association.

3. International Union for the Protection of Infants: Dr. Rousseau-St. Philippe, honorary president of the French section of the union; Professor Marfan, president of the French section of the union.

4. Save the Children Fund International Union: Miss J. Halford, honorary secretary, National League for Health, Maternity and Child Welfare; Dr. d'Espine, honorary professor, Geneva University.

5. International Committee of the Congresses on Public and Private Relief: M. Rondel, secretary-general; M. de Witte, delegate.

6. The following secretaries-general: Dr. R. Sand (League of Red Cross Societies); M. Maquet (International Association for the Promotion of Child Welfare); Dr. Grasset (International Union for the Protection of Infancy): M. E. Clouzot (S. C. F. I. U.).

The congress will include the following sections: (1) maternity; (2) infancy; (3) childhood; (4) social service; (5) child distress and abandonment.

The following questions will be placed on the agenda:

Section 1. Maternity homes (institutions for expectant and nursing mothers).

Section 2. Comparative study of the best means of encouraging breast-feeding.

Section 3. Medical and educational views on the organization of fresh air institutions.

Section 4. Principles of child protection for social workers (orphans, children of sick parents, abandoned and neglected children).

Section 5. Practical study of the working of juvenile courts.

Experts in various countries will be requested to submit reports (maximum length, 2,000 words). These should be sent before Oct. 1, 1927, to the offices of the congress, and will be summarized by a general rapporteur; the report drawn up by the latter will be examined in manuscript by an expert committee. In a meeting held on January 13, the executive committee adopted a list of forty rapporteurs who will be invited to collaborate or who have already agreed to do so.

Members of the congress will have the right to speak in any language they choose. Speeches in any language other than French will be translated at once into that language. Speeches in French will be rendered in English. Reports and minutes will be published in English and in French.

These regulations, which take due account of the rights and importance of all idioms, are intended to secure economy of time and money. They are justified by the fact that, with only a few exceptions, all persons qualified to take part in the congress speak, or at any rate understand, either English or French.

The subscription (20 shillings, $5.00, or an equivalent sum) includes all meetings, receptions, visits, etc., and a copy of the minutes.

Associate members, wives and relatives of members of the congress will pay half this fee. They will be admitted to all meetings, receptions and visits, but will not enjoy the right of speaking and will not be furnished with a copy of the minutes. Visits will be arranged, chiefly to the principal organizations for maternity and infant welfare. The reception committee will be prepared to give all information required concerning hotel accommodation, railway time tables, etc.

An international exhibtion, organized jointly by the three congresses, will be open, July 1 to 15.

The offices of the congress are at 37 Avenue Victor-Emmanuel III, Paris VIII.

HOSPITAL CLINICAL CONGRESS OF NORTH AMERICA

The Hospital Clinical Congress of North America will be held at the Milwaukee Auditorium, Milwaukee, Wisconsin, under the auspices of the College of Hospital Administration, Marquette University, Milwaukee, June 20 to 24.

AMERICAN CHILD HEALTH ASSOCIATION

The next meeting of the American Child Health Association will be held at the Hotel Willard, Washington, D. C., May 9 to 11.

DEATH OF DR. CONSIGLIO

Dr. Luigi Consiglio, pediatrician to the municipal hospital of Sampierdarena, Italy, died on Oct. 3, 1926, at the age of 44.

DEATH OF PROFESSOR CARDARELLI

Prof. Antonio Cardarelli, one of the most esteemed scholars in Italy, died recently. From among the splenic anemias of children, he differentiated the infectious variety now known as kala-azar or leishmaniosis.

NEW ITALIAN PERIODICAL

A new monthly periodical devoted to pediatrics, *Pediatria del Medico Pratico*, has appeared. It is edited by G. B. Allaria, professor of clinical pediatrics at the University of Turin. The charge to subscribers in foreign countries is thirty Italian liras.

Abstracts from Current Literature

Anatomy and Physiology

THE PHYSIOLOGY OF THE PANCREAS OF INFANTS. J. LUKÁCS, Orvosi hetil. **70**:1003, 1926.

The Schmidt-Kashiwado method was used in testing the nucleus digesting power of the pancreatic juice. The results show that the infantile pancreas does not have any nucleus digesting ferments as yet, and the Schmidt-Kashiwado experiment is positive. The nucleus digesting power of the pancreas develops only during the second year of life. It probably has some connection with the beginning of eating meat.

ZENTAY, St. Louis.

Pathology, Bacteriology and Biochemistry

PLACENTAL TRANSMISSION: IV. THE PROTEIN FRACTIONS IN FETAL AND MATERNAL PLASMA. E. D. PLASS and C. W. MATHEW, Am. J. Obst. & Gynec. **12**:847, 1926.

By the method of Wu the authors determined that the plasma protein is consistently higher in the child than in the mother. A normal blood plasma average was determined on fifteen normal unpregnant young women. A relation could not be determined between the plasma concentrations and the birth weight. The average albumin content of fetal plasma was found to be somewhat lower than that of maternal plasma. The globulin is likewise lower. The fibrin, on the other hand, is definitely increased in the maternal plasma.

ALLEN, Chicago.

RENAL NEOPLASMS IN YOUNG CHILDREN. MARTHA WOLLSTEIN, Arch. Pathol. **3**:1 (Jan.) 1927.

The author describes eighteen primary renal neoplasms occurring in children between the ages of 3¼ months and 6 years. The complaint in all cases was enlargement of the abdomen; acute pain or tenderness was not present in any case. The kidney was separated from the neoplasm by a capsule of compressed renal tissue. The neoplasms are heterogenous, but are probably all derived from the same type of embryonal cell at different stages of its differentiation. One spindle cell sarcoma, thirteen adenosarcomas, three leiomyo-adenosarcomas and one rabdomyo-adenosarcoma were found. The more firm the tumor the less apt there is to be metastases; four children with a solid type of tumor have survived operation ten months or more. The prognosis is, therefore, not entirely hopeless.

LESLIE, Chicago.

EFFECT OF INORGANIC SALTS ON CALCIFICATION. P. G. SHIPLEY and L. EMMETT HOLT, JR., Bull. Johns Hopkins Hosp. **40**:1, 1927.

This is a preliminary note on studies to determine what influence is exerted on calcification by individual inorganic salts. Slices of bone and cartilage free from lime salts were kept in solutions prepared to contain calcium, potassium, magnesium, carbonate, phosphate and sulphate in quantities analogous to those found in normal blood serum. The addition of small amounts of sodium chloride

to the basal solutions did not interfere with the deposition of calcium salts in the tissue but when large amounts were added calcification was inhibited.

Further studies are being carried out.

A Supra-Vital Study of the Cells in the Lymph Stream of the Rabbit. J. A. Kindwall, Bull. Johns Hopkins Hosp. **40**:39, 1927.

The lymph was obtained from the point of confluence of the lymph vessels of the neck with the thoracic duct. Great care was taken to have a bloodless operative field.

The average cell count of the lymphocytes was 32,000 per cubic millimeter, with 88 per cent small lymphocytes, 10 per cent intermediate lymphocytes, and large lymphocytes, less than 1 per cent.

Rarely was a monocyte found, and this was thought to be a chance invader of the lymph stream.

Lyttle, New York.

Proteolytic Ferments in Serum. A. Chemically Measurable Toxin-Antitoxin-Binding in Vitro. H. J. Fuchs and M. Von Falkenhausen, Biochem. Ztschr. **176**:92 (Sept.) 1926.

The combination of a toxin with its specific antitoxin is precipitated by 2.5 per cent trichloracetic acid. The precipitation is explained by the formation of a high molecular protein complex from the low molecular toxin and antitoxin. The amount of nonprotein nitrogen left after precipitation of such a combination bears an inverse quantitative relation to the degree of neutralization. The authors believe their experiments lend support to Ehrlich's theory of the chemical nature of toxin neutralization by antitoxin.

Brahdy, New York.

The Origin of the Bifidus Vegetation. Adam, Jahrb. f. Kinderh. **110**:186 (Oct.) 1925.

Adam grew a culture of *Bacillus bifidus* on hematin milk sugar bouillon and hematin milk sugar agar from the stools of various children who were put on feedings that would in some way resemble mother's milk. In each problem from four to ten children were used. The author found that the important element was to prevent the formation of inadequate and to encourage the formation of adequate molecules. To produce modifications resembling mother's milk it was often necessary to produce marked chemical changes.

In problem 1, the proportions of the feeding were: from one half to two fifths milk with flour to which is added 3 per cent butter; 1.5 per cent flour; from 5 to 6 per cent milk sugar.

Here *Bacillus bifiidus* was in the foreground but did not remain long. The children developed diarrhea when parenteral infections occurred and then the bacilli disappeared.

In problem 2, the casein molecule was broken down by the addition of acetic acid or hydrochloric acid (to the mixture used in problem 1) to the *p*H 6.

In problem 3, the calcium and phosphorus were removed by addition of lactic acid to skimmed milk until *p*H 6 was reached. Then it was warmed and filtered. The filtrate was neutralized with ammonia, potassium or calcium hydrate, which brought down calcium phosphate. This filtrate was added to the curds. The whole was neutralized and heated until the casein was almost released. Butter, cream, flour, sugar and water were then added. This mixture contained from 0.03 to 1.6

per cent calcium and phosphorus. This mixture caused the formation of good bifidus cultures and stools resembling stools of the breast-fed child in odor, color and consistency.

EHRMANN, Chicago.

THE USE OF EPINEPHRINE IN BACTERIOLOGIC CULTURES OF THE BLOOD STREAM. S. TANNHAUSER, Klin. Wchnschr. **5**:2258, 1926.

Assuming that the spleen harbored numerous organisms during infectious processes, and on the hypothesis of certain pharmacologic experiments that epinephrine caused compression of the spleen, Tannhauser gave the drug from fifteen to twenty minutes before taking blood for cultures. He found positive culture after this procedure in instances in which negative cultures were found before the injection.

SCHWARTZ, Milwaukee.

HUMAN ISO-ANTIBODIES IN THE BLOOD AND MILK. K. HEIM, Monatschr. f. Geburtsh. u. Gynäk. **74**:52 (July) 1924.

Agglutinations to prove immunobiologic relations between father, mother, and child show that the new-born infant has the same blood type and the same proportions of antigen as the adult of the same race.

Von Dungern's classification was used for the practical tests:

			Proportions in		
Group	Antigen	Antibodies	Middle Europe	Turkey	India
I	A & B	.....	5%	6.6%	8.5%
II	A	Beta	43%	38.0%	19.0%
III	B	Alpha	12%	18.6%	41.2%
IV	O	Alpha & Beta	40%	36.8%	31.3%

Group specificity is found in the first months of fetal life. New-born infants and children usually belong to the group of one of the parents. In a study of generations exceptions were not found. The properties *A* and *B* (antigenic) of the erythrocytes are dominant inheritance characteristics, while "not *A*" and "not *B*" (alpha, beta) as well as *O* (alpha plus beta) are recessive. Grouping is of value in deciding the proportion of single ovum twins. The cause of heterospecific pregnancy is not explained, although in many cases father, mother, and child were group IV. The success or "take" of homoiotransplants of ovaries are not to be attributed to serum groups.

The serum of human milk contains the same iso-antibody reactors as the homologous blood serum. Tissue plasma shows agglutination without any special characteristic. The spinal fluid does not show any agglutination.

THE PERMANENCE OF THE ISO-AGGLUTINATION CHARACTERISTICS OF THE BLOOD. K. HEIM, Monatschr. f. Geburtsh. u. Gynäk. **74**:66 (July) 1924.

The conclusions of Edens and others that there was a change in the iso-agglutination properties of serums after chloroform anesthesia, medicaments, and other factors have not been sustained. Edens' error may have been the result of his microscopic technic. In the microscopic method rouleaux formation is mistaken for agglutination.

Blood matching and typing must be done before each transfusion, since some authors believe that repeated transfusions may change the iso-agglutinins.

The authors prefer the macroscopic. Agglutination precedes hemolysis. The agglutinins are stable — chemicals, freezing, thawing, growth of molds, etc., do not change the properties.

PETERMAN, Milwaukee.

Nutrition

A QUANTITATIVE STUDY OF THE EFFECT OF SODIUM BICARBONATE ON GASTRIC FUNCTION. CHESTER S. KEEFER AND ARTHUR L. BLOOMFIELD, Bull. Johns Hopkins Hosp. **39**:379, 1926.

The authors summarize their work as follows:

(*a*) The introduction of alkali into the stomach causes neither an increase nor a decrease in the volume of the gastric juice secreted.

(*b*) The time at which "free acid" reappears in the stomach contents after the administration of sodium bicarbonate depends largely on the emptying time of the stomach. The more rapid the motility, the sooner "free acid" will appear. Volume of secretion is of less importance.

(*c*) No definite changes in motility can be attributed to alkali on the basis of these experiments.

Finally, (*d*) it may be said that there is no evidence that alkali exercises effects other than a quantitative neutralization of gastric acid.

INFANTILE RICKETS. TREATMENT BY INTRAMUSCULAR INJECTION OF A COD LIVER OIL CONCENTRATE. LAWSON WILKINS AND BENJAMIN KRAMER, Bull. Johns Hopkins Hosp. **40**:52, 1927.

The authors summarize their work as follows:

Two children with active rickets were treated with an ether solution of a concentrate of cod liver oil, injected intramuscularly. Fresh calcification of the rachitic cartilage appeared within three weeks. The changes in the concentration of calcium and inorganic phosphorus of the serum were identical with those previously observed following the oral administration of cod liver oil.

Whereas cod liver oil increases the absorption of phosphorus and calcium from the intestine, the fact that it is effective when administered intramuscularly indicates that this is not purely a local action on the intestinal mucosa but it is a general one and exerted through the circulation.

LYTTLE, New York.

THE DAY AND NIGHT CREATININE AND CREATINE IN THE URINE OF INFANTS. A. S. ROUGICHITCH, Arch. Dis. Childhood **1**:289 (Oct.) 1926.

Infants were immobilized in metabolism beds and samples of urine were collected at three hour intervals through the day and night. The creatine excretion is fairly constant. The output is related to the volume of urine passed. The amount of creatinine excreted is independent of the volume of urine.

KETONEMIA AND KETONURIA IN CHILDHOOD. M. J. BROWN AND G. GRAHAM, Arch. Dis. Childhood **1**:303 (Oct.) 1926.

Of 300 children admitted to the Royal Hospital for Sick Children, 54.7 per cent had acetone bodies in the urine. It would seem unlikely that fever per se exerts a specific action leading to derangement of carbohydrate metabolism. The danger point in ketone production is the beginning of an acidosis. Fourteen

children between the ages of 6 and 12 were put on the ketogenic diet; five children were put on the diet plus sodium bicarbonate; four children were put on the diet plus glucose; four children were changed from the diet to a normal diet, and one child was kept on the diet plus glucose and sodium bicarbonate. The alkali reserve, blood acetone and blood sugar were determined after a few days on a general diet. The ketogenic diet consisted of the following proportions: fat, 25; protein, 5; carbohydrate, 1 (about 3.5:1 $\left(\frac{\text{Ketogenic}}{\text{Antiketogenic}}\right)$. From 600 to 700 calories more than the basal requirement were given. An increase in blood acetone from two to forty times normal occurs on this diet. There is a fall in the alkali reserve and an increase in urinary acetone but not any definite reduction in blood sugar. The administration of dextrose results in rapid diminution of blood and urine acetone with a corresponding rise in the alkali reserve. Soda bicarbonate cannot be depended on to reduce the acetonemia, but increases the alkali reserve.

PETERMAN, Milwaukee.

THE PARIETAL EMINENCE IN RICKETS. J. W. MCINTOSH, Practitioner **117**:252 (Oct.) 1926.

This report is based on the evidence in the County of Durham, where rickets attacks at least 80 per cent of the children. It is the author's opinion, after examining 40,000 children's heads in the last five years, that in the normal head the parietal eminence is small and in some a parietal eminence cannot be detected.

The summary demonstrated that the prominence of the parietal region was less marked in older children. Parietal bossing and frontal bossing can exist quite independently of one another. The marked difference in the size of the parietal eminence in different children depends on the antenatal condition, and the size of the parietal eminence is a good index of the diet and state of health of the mother and probably also of that of the child at the time of its birth.

In a case of caput quadratum, or square head rickets, it is considered that the parietal deformity is antenatal and the frontal is postnatal.

GELSTON, San Francisco.

STUDIES IN PHOTO-ACTIVITY: V. THE RELATIONS BETWEEN PHOTOGRAPHIC AND ANTIRACHITIC ACTION. H. VOLLMER AND J. SEREBRIJESKI, Biochem. Ztschr. **176**:84 (Sept. 14) 1926.

All antirachitic substances tested (an ether extract was necessary in some) were photo-active. The photo-activity is considered entirely a chemical action. Substances may either possess photo-activity or acquire it through the action of ultraviolet rays. Irradiation results in the formation of peroxides or ozonides by the union of oxygen with the easily oxidized and unsaturated bonds. Any compound with an oxygen atom that is readily split off is photo-active. The authors suggest that antirachitic substances exert their effect by the liberation of nascent oxygen in the cells of the body.

HYDROGEN ION CONCENTRATION AND THE ACID BINDING PROPERTY OF BREAST MILK IN BERI-BERI OF IFANTS. B. MATSUMOTO, Biochem. Ztschr. **177**: :118 (Oct.) 1926.

Thirteen infants on a diet of breast milk developed beri-beri. The hydrogen ion concentration of the milk was within normal limits.

BRAHDY, New York.

EXCRETION OF AMMONIA IN CHILDREN. K. KLINKE, Jahrb. f. Kinderh. **110**:159 (Oct.) 1925.

The breast-fed child has an increased ammonia quotient in the urine according to the Breslau school. Czerny and Keller consider this due to the increased fat content of the breast milk, which makes neutralization of the fatty acids by ammonia necessary. Gyorgy drew the conclusion from his investigations that a tendency toward alkalosis was the rule in the breast-fed child.

The author made tests on the urine and blood of the breast-fed child. He found an increase in the alkaline salts of the blood one hour following a diet high in fat. At the same time the ammonia output of the urine was at its height. From these data he draws the conclusion that here the supply of alkalis did not outlast the acidosis, consequently there was an increase of ammonia. After the soaps are synthesized to triglycerides the freed alkali combines with the ammonia salts. The newly formed compounds are then synthesized into urea and are then excreted in the urine.

Klinke believes that his tests show that the increased ammonia output in the urine of the breast-fed child is closely associated with the high fat content of breast milk. Considering the much higher phosphorus pentoxide content of cow's milk as well as the difference in proportion of protein carbohydrate and fat, the tissue reaction of the artificially fed child must be entirely different from that of the breast-fed child.

CONCERNING THE PATHOGENESIS OF HERTER'S INFANTILISM. R. FREISE AND J. M. JAHR, Jahrb. f. Kinderh. **110**:205 (Oct.) 1925.

In two cases of Herter's infantilism (celiac disease) analysis of the feces showed a poor assimilation of fat, salt and carbohydrate, and a somewhat better assimilation of nitrogen. Clinically as well as roentgenologically the poor assimilation was found to be the result of the increased motility of the stomach and small intestine as well as the proximal portion of the colon. After the digestive tract is rested with opium, the assimilation is much improved. With atropin the assimilation is much slower.

The author considers the condition a vegetative neurosis appearing as part of a general weakness of the nervous system.

EHRMANN, Chicago.

INACTIVATION OF THE ANTIRACHITIC FACTOR IN COD LIVER OIL BY EXPOSURE TO ULTRAVIOLET LIGHT. A. ADAM, Klin. Wchnschr. **5**:1648, 1926.

Cod liver oil in a layer, with a thickness of from 2 to 3 mm., was exposed to ultraviolet light for one-half hour, at a distance of 30 cm. Its antirachitic effect was then tested on fifty young rats weighing from 30 to 50 Gm., on nine premature infants, fifteen rachitic infants and three infants with spasmophilia. The rats received diets 4025 and 3134 of McCollum. The cod liver oil was given in one-fourth, one-half and one per cent of the diet volume that was previously powdered. The rats were kept separately.

Eighteen animals with severe rickets demonstrable roentgenologically and anatomically were used as controls. Fourteen animals that received ordinary cod liver oil became free from rickets, while those fed on the irradiated cod liver oil uniformly remained rachitic. The result was particularly striking in one litter of eight animals. Two controls and three animals with the addition dosage of 0.25 per cent irradiated cod liver oil showed equally severe rickets, while the three with 0.25 per cent addition of ordinary cod liver oil became free from rickets in a period of four weeks.

The same results occurred in the infants. Of nine premature infants kept for a period of eight weeks on the acid fat milk of the author's diet with the addition of 0.5 per cent irradiated cod liver oil, six infants developed craniotabes and some showed rachitic rosary. Of fifteen rachitic infants, only five showed improvement in a four or five weeks management, and of the three spasmophilic infants, only one showed improvement.

The conclusion is unavoidable: Cod liver oil is inactivated by exposure to ultraviolet light. A study of the physical and chemical changes undergone by cod liver oil during exposure to ultraviolet light was made, with the following results:

1. The absorption spectrum studied with the Krauss quartz spectrograph showed a greater light transmissibility for the irradiated cod liver oil. As the same physical results were obtained by Hess with inactivated cholesterin, its significance cannot be gaged.

2. Irradiated cod liver oil blackens photographic plates. The significance of this phenomenon is uncertain, as activated plant oils exhibit the same phenomenon.

3. Fluorescence was increased by irradiation.

4. The oil showed a greater emulsion capacity after irradiation.

5. Irradiated cod liver oil blackens after being heated to 250 degrees, while ordinary cod liver oil only turns brown.

6. The viscosity was increased by irradiation.

7. Parallel with the change in viscosity, an increase in the surface tension occurs. As von Hahn has shown that vitamin containing substances possess a low surface tension, and that butter loses some of its antixerophthalmic factor after irradiation, this observation is significant. It suggests the possible loss of vitamins.

8. With increase in the duration of irradiation the iodine number increases.

9. An appreciable oxydative splitting occurs, recognizable in the increased acidity. Cod liver oil that has not been irradiated has a *p*H 7, and after a short irradiation, *p*H 4.3. After sixteen hours of irradiation, the *p*H is 3.8. The titratable acidity, measured with alcoholic normal sodium hydroxide, shows similar characteristics. Unirradiated cod liver oil is 0, and after brief irradiation it is 24.0.

Adam discusses the relationship of these changes to the structural formula of cholesterin and promises further investigations to determine the nature of the antirachitic factor.

Influence of Pasteurization on the Antiscorbutic Properties of Milk. E. Seligmann, Klin. Wchnschr. **5**:1818, 1926.

These investigations showed that the variations in the natural vitamin content of raw milk is greater than the variations present in a given milk before and after pasteurization. The hygienic value of pasteurization far outweighs its effects of this character. The universal use of orange juice takes care of any vitamin deficiency. Guinea-pigs do not afford ideal test subjects for the study of scorbutus.

Irradiated Cholesterin in the Treatment of Rickets. A. Hottinger, Klin. Wchnschr. **5**:2061, 1926.

Experimental rickets of rats was healed by irradiated cholesterin equally as well as that treated by direct irradiation of the affected animals. Cholesterin irradiated for longer than four hours, at 60 cm., becomes inactive. All cholesterin

preparations whose melting point was reduced by irradiation to lower than 143 degrees became inactive. Rickets in children was healed by milk that had been irradiated (probably due to cholesterin content?). This was more effective than cod liver oil and equally as effective as irradiation of the child by ultraviolet light. Irradiated cholesterin must be given in large doses (from 2 to 2.5 Gm. daily). It must be given as dry substance or in oil suspension. Aqueous suspensions are inactive.

Quartz Lamp Exposure of Cows and the Antirachitic Value of Their Milk. C. Falkenheim, Klin. Wchnschr. **5**:2071, 1926.

Milk of cows exposed to the quartz lamp showed slight healing properties for rickets. The use of milk from cows so treated had definite antirachitic value when given to rats fed on preliminary rickets producing diets.

Schwartz, Milwaukee.

Some Investigations of the Excretions of Phosphate in Relation to Carbohydrate Changes. Paul Iversen and A. Thisted, Ugesk. f. Læger. **88**:1103, 1926.

The phosphate excretion is, as a rule, at maximum in early morning, falls during the day and rises in the afternoon. There is not any fixed variation between day and night excretion.

Insulin does not have any influence on the phosphate excretion in normal or diabetic persons. In patients with acidosis there is a marked fall after insulin or insulin with sugar is given.

The phosphate excretion is comparatively higher than the ammonia excretion after an acidotic condition is relieved.

There is not any evidence from the tables and graphs to support the assumption that insulin acts to bring about phospho-hexose compounds.

Schlutz, Minneapolis.

Prenatal Conditions

Intra-Uterine Death of the Fetus Due to Abnormalities of the Umbilical Cord. Report of Three Cases. E. L. King, Am. J. Obst. & Gynec. **12**:812, 1926.

The author discusses causes of antenatal death of the fetus and feels that lesions of the umbilical cord are more frequently the cause than is generally believed. He cites three case histories.

Report of a Case of Acrania Causing Malpresentation and Accidental Hemorrhage. A. J. Fleischer, Am. J. Obst. & Gynec. **12**:885, 1926.

Fetal monstrosities commonly cause malpositions and consequent difficulty in labor. The case described showed the unusual combination of a well developed brain with the dome of the calvarium missing. The brain was included in a meningocele which was attached to the membranes. Traction on this attachment caused partial separation of the placenta and profuse maternal bleeding. There was also marked exophthalmos of the right eye, double harelip, cleft palate and syndactylism in both extremities. The child lived for two hours after birth.

REPORT OF A CASE OF CONGENITAL MALFORMATION AND ARRESTED DEVELOPMENT OF THE COLON. G. K. SIMS AND H. L. MEYERS, Am. J. Obst. & Gynec. **12**:887, 1926.

The authors were able to find only eleven similar cases to the one they describe reported in the literature.

The infant, a girl, was born one month before term, weighing 1,833 Gm. During the first sixty hours the infant regurgitated after each feeding; nothing was passed by rectum. The upper abdominal quadrant was greatly distended and tympanitic. A rubber catheter could be passed into the duodenum. When passed per rectum an obstruction was met at 10 cm.

At operation it was found that the colon was represented by a cord-like structure, without a mesentery, that extended from the ileocecal junction diagonally upward just below the navel to the left costal margin and down to the crest of the ileum. Here it widened into the colon again. The appendix was attached to the distal end of the ileum. Microscopic sections of the cord-like structure did not reveal any lumen for the first 4 cm. and then a gradually increasing opening.

ALLEN, Chicago.

CONGENITAL ATRESIA OF THE ALIMENTARY TRACT. W. P. H. SHELDON, Arch. Dis. Childhood **1**:279 (Oct.) 1926.

In 6,000 autopsies at the Great Ormond Street Hospital since 1900, there were twenty-eight cases of congenital atresia of the alimentary tract. Congenital narrowing without obliteration was found in six cases. The sites of obstruction were as follows:

	Atresia	Partial Stenosis
Esophagus	6	2
Duodenum		
Above bile papilla	2	1
At bile papilla	2	1
Below bile papilla	2	0
Small intestine	13	0
Large intestine	3	2

The treatment is early surgical intervention.

CONGENITAL DUODENAL STENOSIS DUE TO PERITONEAL BANDS. T. T. HIGGINS AND D. PATERSON, Arch. Dis. Childhood **1**:285 (Oct.) 1926.

Stenosis may arise from a developmental error in the intestine itself with partial or complete absence of lumen (duodenal atresia), or there may be compression or constriction of the viscus by abnormal peritoneal bands or adhesions. A case is reported in which a new-born infant began vomiting bile-stained material on the second day. On the tenth day the infant was operated on. The pylorus was obscured by peritoneal bands. The bands were cut with scissors, and the obstruction was relieved.

PETERMAN, Milwaukee.

A CHILD BORN AFTER ATTEMPTED STERILIZATION OF THE MOTHER BY ROENTGEN RAY. (UN BAMBINO DEI RAGGI X.) PIERO BARBACCI, Riv. di clin. pediat. **24**:806, 1926.

The mother suffered with rheumatic endocarditis (mitral insufficiency). She had had two pregnancies that had been complicated by nephritis and cardiac

decompensation; it became necessary to end the third pregnancy for the same reason. Roentgen rays were used to kill the embryo and temporarily sterilize the mother. However, several months later the mother began to menstruate and then became pregnant; in spite of cardiac decompensation and nephritis, she delivered a normal baby at term. She nursed the baby at the breast for ten months. The child was 11 months of age when examined by the author and found to be normal. The author emphasizes that in this case, the roentgen-ray treatment on the mother did not have any effect on the ovum that developed into the child.

HIGGINS, Cincinnati.

THE INFLUENCE OF INSULIN ON THE WEIGHT CURVE IN PREMATURE AND WEAK INFANTS. A. MAHNERT, Monatschr. f. Geburts. u. Gynäk. **64**:347 (Oct.) 1926.

Eleven premature infants weighing from 1,250 to 2,000 Gm. were fed breast milk, and given three daily injections of one unit of insulin on four successive days. The injections were repeated in from two to six days if necessary. Some received an additional 1 to 3 Gm. of glucose (in 20 per cent solution) by mouth. In one case the initial loss in weight was 12 per cent. The return to the birth weight always occurred within from nine to sixteen days. The best results were in those receiving insulin and glucose from the day of birth. Physiologic icterus disappeared within two weeks. At 3 months the infants weighed from 2,500 to 3,200 Gm. Two of the eleven infants died. One was taken from the hospital at 3 weeks and given a cow's milk formula at home. The other died at 3 months after a sudden drop in weight. Autopsy in the latter case revealed bilateral fibromas in the medullae of the kidneys.

The author also found a similar method of giving insulin and glucose valuable in underweight full-term infants, who did not gain weight steadily on an ample diet.

BRAHDY, New York.

CONGENITAL CONTRACTURE OF THE KNEE JOINT. H. BRANDT, Monatschr. f. Geburtsh. u. Gynäk. **64**:359 (Oct.) 1926.

The legs of this patient could not be extended beyond 110 degrees. In view of other minor anomalies present, Brandt considers it a case of arrested development.

BRAHDY, New York.

Diseases of the New-Born

INTRACRANIAL HEMORRHAGE OF THE NEWBORN. JOHN F. DICKS, Am. J. Obst. & Gynec. **12**:871, 1926.

Dicks reports two cases of intracranial hemorrhage occurring during labor. Both patients were treated by spinal puncture with marked improvement. He reminds us that breech deliveries are responsible for more cases of intracranial hemorrhage than any other complication of labor, and also that this complication is ten times as frequent in premature as in full term deliveries.

ALLEN, Chicago.

FEEDING OF THE NORMAL INFANT AT BIRTH. MAYNARD LADD, Boston M. & S. J. **196**:50 (Jan. 13) 1927.

The following points are emphasized: All are agreed that the feeding of choice is mother's milk. Weighing the newly born breast-fed infant before and after

nursing is important since inanition fever is often the result of insufficient fluid intake due to the tardy establishment of lactation.

While the average breast-fed infant with an abundant milk supply satisfies his caloric requirements on four hour feedings, one might formulate a rule to the effect that in general the feeding interval should only be as long and the number of feedings as few as is consistent with the infant's comfort and with normal digestion and rate of gain. Percentage feeding in a broad sense is simply an expression of the relative proportions of the food elements to each other and to the total quantity.

The quantity of such a mixture should be such as to yield at least 45 calories per pound of weight per day. The smaller the infant, the higher must be the energy quotient, which in undernourished infants several months old may be as high as 65, 75 or even 80 calories per pound.

The protein requirement is usually satisfied by 1 Gm. of protein (or one of milk) to each pound of weight per day, gradually increased to 1.5 Gm. at 2 or 3 weeks and 2 Gm. at 2 or 3 months. When whole milk is used as a basis of feeding, the amount of milk required to supply the protein need supplies sufficient fat. Additional calories from added sugar, preferably a dextrimaltose, should not exceed an amount that would give more than 6 or 7 per cent of total sugar in the mixture.

Barley water facilitates the subdivision of the curd, and may possibly contribute something of value besides because of its mineral and vitamin content.

Lactic acid mixtures cultured or acidulated, do not offer any advantages over sweet whole milk in normal feeding, but are of great importance in cases of intestinal indigestion, acute or chronic, and in infectious diarrhea.

Finally, the criteria of successful feeding are to be found in normal digestion, freedom from discomfort, regular and quiet sleep, and steady gain in weight.

GENGENBACH.

CAUSATION OF FOETAL DEATH. CLARA. D. TINGLE, Arch. Dis. Childhood **1**:255 (Oct.) 1926.

One hundred and sixty autopsies were performed on still-born viable fetuses and on children dying within seven days of birth. Traumatism at birth was the cause of 105 deaths. In 93.1 per cent of the infants there was hemorrhage of some degree, but in fifty per cent the hemorrhage was petechial and not the cause of death. Gross hemorrhage occurred in 37.5 per cent, visceral in 5.6 per cent. Tears of the tentorium were found in fifty-eight cases, and in fifty-seven a hemorrhage had occurred. Considering the etiology of hemorrhage, the predisposing factors were prematurity and syphilis; the immediate causes, congestion, hemorrhagic diathesis and trauma. The coagulation time on the first day was that of the mother; after that it was a little prolonged until the end of the first week. In only four cases was there a noticeable delay in the clotting time. Pneumonia is the commonest infection causing neonatal death. There were four cases of congenital heart lesion in the series.

PETERMAN, Milwaukee.

PURULENT PLEURISY IN THE NEW-BORN. S. FABRIS, Pediatria **35**:23, 1927.

Fabris reviews the literature and reports a case of his own. The patient was 3 days old when she was transferred to his service because of rapid loss of weight and a generalized cutaneous edema. Death ensued two days after admission. Autopsy disclosed a frank empyema on the left side, with from 10 to 15 cc. of a turbid, slightly bloody fluid on the right. A long chain streptococcus was isolated from either side.

The mother of the child was a 27 year old primipara, and had a normal labor. Immediately after the expulsion of the fetus, there was a gush of fluid of dark bloody color and fetid odor.

SALA, New York.

CONTRIBUTION TO THE STUDY OF GONORRHEAL ARTHRITIS AND PERIOSTITIS IN THE NURSING BABY. MARIO RASPI, Riv. di clin. pediat. **24**:793, 1926.

A male infant at 8 days of age began to show signs of acute arthritis and periostitis, which during the next two weeks involved the right radiocarpal joint, the internal malleolus of the left leg, the right humeroscapular joint and the two proximal phalanges of the fourth finger on the left hand. Later, other phalanges and the right hip became involved. Gonococci were found on smear and by culture of the pus obtained by aspiration of a joint. Recovery was complete except for some stiffness of the hip and was probably hastened by the use of vaccine therapy. The author believes that gonorrheal septicemia was contracted in utero.

HIGGINS, Cincinnati.

THE DEVELOPMENT OF EMPHYSEMA IN THE ASPHYCTIC NEW-BORN. E. POECK, Monatschr. f. Geburts. u. Gynäk. **64**:341 (Oct.) 1926.

This is a report of two infants who were delivered spontaneously at term, and died six hours post partum. The amniotic fluid in each case contained meconium. Many methods for resuscitation were employed, but not direct pulmonary insufflation. Autopsy showed diffuse pulmonary emphysema without evidence of aspirated material. One infant had a pneumopericardium.

BRAHDY, New York.

Acute Infections

STUDIES IN SCARLET FEVER. THE RELATION OF THE SPECIFIC TOXEMIA OF SCARLET FEVER TO THE COURSE OF THE DISEASE. FRANCIS G. BLAKE AND JAMES D. TRASH, J. Clin. Investigation **3**:397, 1926.

This study is based on observations made before the administration of antitoxin in 132 cases of scarlet fever. Presence or absence of the scarlet fever toxin in the blood was determined and the amount estimated. These results were analyzed with reference to the day of the disease on which the blood was taken, the estimated clinical severity of the case, the presence of rash and the presence of septic complications. Results showed that the duration of the specific toxemia parallels the duration of the rash; the degree of toxemia while the rash was still present parallels the presence of severity of septic complications; with the fading of the rash, the specific toxemia disappears or is of a low degree, even though severe septic complications continue.

STUDIES IN SCARLET FEVER: III. INFECTIONS WITH STREPTOCOCCUS SCARLATINAE IN PERSONS WITH SCARLATINAL ANTITOXIN IMMUNITY. EDITH B. NICHOLLS, J. Clin. Investigation **3**:411, 1926.

Twenty-one strains of *Streptococcus hemolyticus* were obtained from twenty-one patients suffering from various acute infections such as tonsillitis and pharyngitis. Filtrates were made according to the method described by Dick. With one skin test dose all filtrates gave positive reactions in persons with positive Dick

reactions and negative reactions in persons with negative Dick reactions. But, for further identification, each filtrate was subjected to a neutralization test with known blanching and nonblanching serums. The toxic action of ten of the filtrates was neutralized by the blanching but not by the nonblanching serums, while neutralization of the other eleven did not take place. It is concluded that the infection in the ten cases was due to *Streptococcus scarlatinae*, although none of the patients developed clinical scarlet fever, and nine of them had shown a negative Dick test. There was in these cases a history of intimate exposure to scarlet fever, while of the eleven patients in whom the streptococcus was not scarlatinal only one had any knowledge of exposure.

From this discussion it is apparent that a negative Dick test does not necessarily prevent the development of severe local pyogenic infections with the scarlet fever streptococcus and that persons without any clinical symptoms of scarlet fever may be a dangerous source of infection.

STUDIES IN SCARLET FEVER: IV. POST SCARLATINAL IMMUNITY IN PATIENTS TREATED WITH ANTITOXIN. J. A. V. DAVIES, J. Clin. Investigation **3**:423, 1926.

The Dick test for immunity to scarlet fever was made in one and four skin test doses on fifty former patients, thirty-four of whom had received scarlet fever antitoxin about five months previously. The serum in seventeen cases was tested for its blanching property, and in eight cases neutralization tests were made. It was found that the degree of late immunity, as judged by skin tests, which was developed by patients who did not receive antitoxin, was much greater than that developed by those who had and paralleled the antitoxin content of the serum, whether this was tested by blanching or by neutralization experiments.

LESLIE, Chicago.

THE SPREAD OF DROPLET INFECTION IN SEMI-ISOLATED COMMUNITIES. SHELDON F. DUDLEY, Medical Research Council, Special Report Series No. 111, 1926.

The Royal Naval School, Greenwich, was used as a basis for the study; other institutions of similar character, county council schools, foundling schools, and naval ships were studied for comparison. The boys at Greenwich were from 11½ to 15½ years old. The diseases especially studied were diphtheria, scarlet fever, rubella, mumps, measles, chickenpox, influenza, sore throat and meningitis.

After an exhaustive study of many phases of the subject, the following outstanding conclusions were made:

1. Host resistance to parasitic infection may be specific or nonspecific; the former is dependent on previous contact with the specific parasite; the latter may be inherent or the result of contact with other nonspecific proteins.

2. Host resistance varies greatly in magnitude and duration.

3. "Herd immunity" is that resistance developed by the population as a whole, and "herd immunity index" is the ratio of those who are immune to those who are susceptible to any given disease. Epidemics are largely dependent on this index plus the pathogenicity of the organism.

4. A certain minimum mass of infective agent is necessary before it can infect a host. Less than this amount will be destroyed by the host and the resistance of the host is thereby changed. This was especially shown by the effect of carriers when the beds were closer in some of the dormitories than in others.

Subinfective doses tend in most cases to vaccinate the host, and in groups raise the herd immunity. If the subinfective doses are received faster than the host can destroy them, their sum may form an infective dose, thereby causing the disease clinically.

5. Isolation, especially in sleeping quarters, was found to be of great importance in diminishing the spread of the diseases in this group.

Age of individuals and the rate of change of population of the schools were two noticeable factors in the incidence of most of the diseases, as contact with infection produced individual immunity with or without the disease clinically and raised the herd immunity as a whole.

BARNETT, Chicago.

POST-SCARLATINAL MENINGITIS. J. GRAHAM FORBES, Lancet **211**:1207 (Dec. 11) 1926.

A girl, aged 6 years, went through an ordinary attack of scarlet fever without complications except for adenitis during the third week. A little more than two months after the onset of the scarlet fever she complained of ear-ache off and on for three weeks and then severe headache and stiffness of the neck. She was admitted to the hospital three months after the onset of the scarlet fever in a semicomatose state, with typical signs of meningitis. She died the day after admission. Autopsy was not performed.

Lumbar puncture showed on culture long-chained streptococci, and on subculture hemolytic streptococci. The streptococcus was serologically identical with one of the strains isolated by Dochez in association with scarlet fever.

The author cites among others the paper of René Benard (1909) who in a total of 13,550 cases of scarlet fever found only nine that were reported as complicated by meningitis.

LANGMANN, New York.

THE EARLY TREATMENT OF FAUCIAL DIPHTHERIA. J. H. WHITAKER, Practitioner **117**:222 (Oct.) 1926.

The author makes a plea for early recognition to be based on clinical rather than bacteriologic evidence. Absolute rest in bed is essential. Food should be nourishing and liberal. Enemas are of value. Alcohol is a great aid in treating any severe case of diphtheria. Local treatment is altogether unnecessary. In glandular cases, poultices are of value.

The author's advice is 6,000 units of antitoxin in mild cases; 12,000 units in moderate cases; 18,000 units in severe cases, repeated every 12 hours until there is a well marked effect on the membrane. The severity should be judged by the amount of the membrane. Any case of double infections, for instance, faucial and nasal, should be treated as severe. Conjunctivitis of any kind should be treated as severe.

The first dose of antitoxin should be given intramuscularly and afterwards continued by subcutaneous injections of polyvalent antistreptococcic serum, at least 50 cc. It is important to remember that the antitoxic serum frequently varies in potency and that the type of diphtheria varies in different localities.

It is the author's opinion that there has been some subtle change in diphtheria of late years and that larger doses of antitoxin are required. Some of these serum sicknesses seem more severe than in former times.

GELSTON, San Francisco.

THE TREATMENT OF SCARLET FEVER WITH SPECIFIC ANTITOXIN SERUM. W. T. BENSON AND D. P. MACIVER, Edinburgh M. J. **33**:701 (Dec.) 1926.

The authors report the effect on the symptoms of scarlet fever by streptococcus antitoxin given during the first four days of the disease in children. They compare the course in 107 cases with an equal number not receiving serum. One injection was given, 10 cc. intramuscularly. The conclusion is that the pyrexia is shortened if serum is given within forty-eight hours of the onset. With early administration, the rash was less intense and disappeared within from twelve to eighteen hours. The nervousness and restlessness due to toxemia were reduced. Eighteen children had complications, while in the control cases there were twenty-eight. The authors believe that even by the treatment on the first day, the use of the serum is not a universal safeguard against septic complications during convalescence. Thirty-four per cent of the injections of antitoxin resulted in serum sickness, in not any instance being alarming.

NEFF, Kansas City.

CONTRIBUTION TO THE THERAPY OF PYOGENIC SEPSIS. M. GIUFFRE, Pediatria **35**:1, 1927.

The author employed a mixed vaccine of various strains of pyogenic streptococci and staphylococci, freshly isolated, each cubic centimeter of vaccine containing from 2 to 3 billion germs, in the treatment of six cases of pyogenic infection of the skin and scalp, and four cases of acute osteomyelitis. In the latter group the vaccine therapy was used as adjuvant to surgical measures. The vaccine was administered intramuscularly in eight cases, including all the four of osteomyelitis; here the initial dose was 0.5 cc., and it was gradually increased to as much as 5 cc., the injections being given on alternate days. In two cases, both of superficial sepsis, the vaccine was given intravenously, the initial doses being 0.4 cc. and 0.5 cc. respectively, and the administration also on alternate days. In all ten cases the vaccine visibly influenced the course of the sepsis. Moderate reactions followed the initial doses; as the patients improved, reactions to the vaccine did not take place. The author believes that mixed stock vaccines containing about the same general types of organisms as those found in the lesions are preferable to autogenous vaccines.

OBSERVATIONS ON THE COMPLEMENT FIXATION TEST IN CHICKENPOX, AND IN SOME CASES OF PRESUMABLE CHICKENPOX WITHOUT ERUPTION. A. F. CANELLI, Pediatria **35**:13, 1927.

Canelli reports three series of observations. In the first series are two cases of clinically certain chickenpox, one case of chickenpox without cutaneous eruption, but with typical vesicles on the hard palate, mucous membrane of the cheeks and gums, and a fourth case which presented the prodromal symptoms but neither the enanthem nor the exanthem of chickenpox. All children were in the same family. The third child became ill four days after the first two, the fourth two days after the third.

The technic employed was the usual Wassermann reaction; the antigens used were aqueous suspensions and alcoholic extracts (*a*) of the seropurulent contents of the pustules, and (*b*) of the crusts of the pustules. In each case the patient's serum was employed in its active state and also after inactivation.

The active serums of the two cases of clinical chickenpox gave positive reactions with their respective antigens. The active serums of the third and fourth cases gave positive reactions with the antigens from the first two cases.

The inactivated serums of all four cases gave negative reactions with aqueous suspension antigens, and positive reactions with alcoholic extract antigens.

It is then apparently possible to diagnosticate chickenpox serologically without an exanthem.

All four cases in this series gave negative serologic reactions for syphilis.

The same technic was employed in a second series of nine cases, all serologically free from syphilis. The clinical diagnosis of chickenpox was certain in seven cases (*E, F, G, H, I, L, M*), doubtful in case *N* in which the exanthem was atypical and limited to the legs and feet, and not suspected in case *P* without an exanthem. Patients *N* and *P* each had a brother affected with chickenpox.

Of the seven cases of true clinical chickenpox, three only (*E, H, M*) gave positive reactions with homologous antigens. Of the two doubtful cases, only case *P* gave positive reactions with heterologous antigens (from case *H*).

The inactivated serums of *E, H, M* gave negative reactions with aqueous antigens. The active serums gave positive reactions.

The inactivated serums of *E, H, M* gave positive reactions with alcoholic antigens. The active serums gave negative reactions.

The serum of case *P* behaved similarly to those of *E, H* and *M* with the heterologous antigen (derived from case *H*). Here again the possibility is evident of the serologic diagnosis of chickenpox without the exanthem.

In a third series of observations the author got negative reactions for chickenpox in eight children who had not had the disease. These comprised two cases of chronic catarrhal bronchitis with positive tuberculin reactions, two cases of proved pulmonary tuberculosis, two cases of subacute gastro-enteritis, and two cases of measles.

ACUTE B. COLI ARTHRITIS IN AN INFANT. S. CIACCIA, Pediatria **35**:36, 1927.

Ciaccia reports a case of acute pyogenic arthritis of the left shoulder joint in a child, aged 1 year. The pus evacuated at operation was greenish yellow, creamy, and of foul odor. Gas was not present. Bacteriologic examination and culture on differential media conclusively proved the infection due to *B. Coli* in pure culture. Surgery and administration of autogenous vaccine gave an excellent anatomic and functional result.

The author argues that the clinical picture and rapid recovery tend to exclude osteomyelitis, though the possibility remains of the presence of minimal osteomyelitic lesions. The infection in Ciaccia's case was presumably hematogenous.

SALA, New York.

CONTRIBUTION TO THE STUDY OF DYSENTERY CAUSED BY "LAMBLIA INTESTINALIS" IN INFANTS. GINO GRAZIANI, Riv. di clin. pediat. **24**:812, 1926.

The author reports five cases of subacute ileocolitis in children between 3 and 5 years of age. Parasites and cysts of *Lamblia intestinalis* were found in the stools and were believed to be the etiologic agent. The condition was characterized by alternate periods of amelioration and exacerbation, the occurrence of blood and mucus in the stools, the absence of other etiologic agents and the presence of marked eosinophilia. Good therapeutic results were obtained by the use of arsenical preparations.

HIGGINS, Cincinnati.

HEINE-MEDIN'S DISEASE. M. MUNOZ VALENZUELA, Arch. Chilenos de Pediat. **3**:197, 1926.

A case of polio-encephalitis is reported in a patient 18 months of age, in which the cerebral manifestations were a prominent feature. The author refers to the present unsatisfactory status of the therapy of this disease, and reports his research with Dr. Vicente Carulla of Barcelona on the use of roentgenotherapy. Bordier, in 1922, reported the beneficial action of roentgen-ray exposures over the spinal cord in this disease. The part to be treated should be determined with accuracy. If the arm is involved the cervicodorsal portion of the cord is irradiated, and the lumbodorsal region if the leg is affected. The author varies from Bordier's technic in that he does not give as large a dose. The anticathode is placed 40 cm. from the spine and 1 or 2 mm. aluminum and 5 mm. copper or zinc filter is used. Bordier used the anticathode 15 cm. from the skin, an equivalent of 25 cm. of spark and used a 5 mm. aluminum filter.

The benefit from roentgen-ray exposures probably comes from a destruction of the cellular infiltration and lymphocytic elements that have extravasated into the anterior form, and by hastening absorption of these products, compression of the nerve cells is shortened. The author believes that these cellular and lymphatic infiltrations are more susceptible to the rays than the normal nerve cell and refers to the difference in reaction of tumor cells and normal tissue cells in the irradiation of tumors.

There are those who believe that the cells are stimulated to greater resistance to the invading organism, and that the rays stimulate directly the biologic vitality of the cell that has been impaired by the disease. There is doubt of the stimulating action of the roentgen ray in the ordinary dosage.

The author suggests the possibility of the roentgen-ray treatment being beneficial after the acute stage, preventing a continued pressure of the nerve cells by lessening the amount of sclerosis.

Among the first cases, treated soon after the infection, a dose of 15 per cent skin unit doses on three successive days was given. After a rest period of from one to three days this was repeated. In long standing cases, a larger dose, from 75 to 80 per cent skin unit doses, was used, with the intention of modifying the amount of sclerosis taking place in the anterior form.

As a result of his experience, Munoz believes that the treatment if given early yields excellent results. If it is given later in the disease to lessen the sclerosis, the results are encouraging. In one patient treated three months after the onset of the disease, a dose of 75 per cent improved the paralysis in an arm, and in another case of three months' duration 40 per cent failed to improve the paralysis of the lower extremities. A group of fifty patients were given from 10 to 20 per cent doses to study the effect of the stimulating action of the rays on the nerve cells, but without favorable results. The dose is greater the longer the duration of the disease. If the duration is less than two months, from 40 to 50 per cent is given on three or four successive days. If the duration is more than two months, from 70 to 80 per cent is required. It is necessary to repeat the dose in several months.

The contraindications to irradiation of the cord are few. The possibility of a deleterious effect on the ovaries from exposures in the lumbosacral region is mentioned. In one girl who received treatment at the age of 10 years, menstruation began at 11 years, and the possibility that this precocity was influenced by the treatment is mentioned.

DWYER, Kansas City.

EXPERIENCE WITH MEASLES CONVALESCENT SERUM. C. BARON, Med. Klin. **23**:48, 1927.

The author had unsatisfactory results with convalescent serum in an orphans home. Infants who received injection on the ninth day did not receive protection, and 46 per cent of the cases showed more or less serious complications. Injections given to make the course of the disease milder remained without any effect, and 80 per cent of the older children who received the injection on the eleventh day after the first case of measles was seen also showed serious complications. In 70 per cent of the infants and in 50 per cent of the other cases, the incubation period was somewhat lengthened.

ZENTAY, St. Louis.

DIAGNOSTIC STUDY OF JUVENILE TYPHOID. JOSEF RIHA, čas. lék. česk. **64**:1161 (Aug.) 1925.

Of 140 patients studied, 109 were of school age, and thirty-one were of preschool age. From the standpoint of history, cases were classed as enteral, nervous, pulmonary, pharyngeal and appendical. Clinical grouping is benign, mild, septicotoxic, hemorrhagic, ataxicodynamic, meningeal and bronchopneumonic. Of the six deaths five were the result of the latter severe types. The younger the child the less typical the symptoms as compared to the adult form. The infantile type may begin as a congenital typhoid without involvement of the placenta, although the latter condition usually produces abortion or premature birth. The infantile type is atypical in symptomatology. Transmission through breast milk could not be verified by several observers, and nursing by mothers with typhus is not contraindicated except in a severe condition of the mother. The agglutinins are more concentrated in the milk than in the blood serum. A Widal test is of little value in these cases. Temperature and leukocyte curves are shown. Symptoms, physical and laboratory observations, pathologic anatomy, convalescence and sequelae are given. Roseola appeared in fifty per cent of the cases and enlarged spleen in all but one case. There was a tendency to loss of speech, and 12 per cent of the patients had recurrences or exacerbations. It was felt that a great number of the cases were milk-borne.

STULIK, Chicago.

THE VALUE OF SERUM TREATMENT IN DYSENTERY. K. KALOCSAY, Orvosi hetil. **70**:218, 1926.

Polyvalent specific serum was used in dosage ranging from 50 to 100 cc. The author thinks that early injection of the serum has a favorable effect on the course of the disease. After the second or third day the effect is practically nil.

PREVENTION OF SCARLET FEVER WITH THE DICK METHOD. J. BOKAY, Orvosi hetil. **70**:659, 1926.

This is the second report of Dr. Bokay on a large material in which Dick tests were used and also active immunization with the Dick toxin.

His conclusions are as follows:

1. The experiences with the Dick test in 6,007 cases are practically identical with the original experiences of Dr. Dick. There seems to be a close connection between the susceptibility to scarlet fever and a positive Dick test, and so the method has a great importance in prevention.

2. Active immunization with the toxin with increasing doses makes the Dick test negative in 90 per cent of the cases, and this immunity seems to be permanent.

3. The untoward effects of the immunization are mild and of short duration and certainly should not be considered as a contraindication against the extensive use of the method. It is to be hoped that with the Dick test and active immunization, scarlet fever epidemics will be successfully controlled.

PREVENTION OF SCARLET FEVER WITH THE DICK METHOD. B. JOHAN, Orvosi hetil. **70**:687, 1926.

The author's work was carried out in connection with the work of Dr. Bokay. His results are practically identical with those obtained by Dr. Dick. Hemolytic streptococci were found in the throats of 97.6 per cent of patients having scarlet fever. From the point of view of prevention, the author thinks it is important that the streptococci should be eliminated from the throat of convalescent patients before they are discharged from the hospital. His results with the Dick test seem to support the specificity of the reaction. The statistics on morbidity of patients tested show that persons who are naturally negative to the Dick test are practically immune to scarlet fever. Active immunization seems to give a good protection if the toxin doses used were sufficiently large. Passive immunization can be done with convalescent or animal serum and should only be used in cases in which direct exposure occurs.

ZENTAY, St. Louis.

DIPHTHERIA BACILLI IN VULVOVAGINITIS. V. SZARKA, Orvosi hetil. **70**:1194, 1926.

Loeffler bacilli were found in the secretion of seven children affected with vulvovaginitis. There were not any signs of any diphtheric vulvitis; neither was there any history of such a condition. Attention is called to this fact, as children of this type may be sources of diphtheria epidemics.

TREATMENT OF WHOOPING COUGH WITH ROENTGEN-RAY IRRADIATION. Z. HRABOVSZKY, Orvosi hetil. **70**:6347, 1926.

Treatment of pertussis with the roentgen ray seems to give results that deserve attention. The irradiation of the liver seems to be more effective than that of the hilum. This is probably a protein reaction, and the treatment is an autoprotein and heteroprotein therapy. Pertussis is not a simple infection but is a disease due to hypersensitivity to protein, probably on the basis of a specific diathesis.

ZENTAY, St. Louis.

"SERUM SICKNESS" FROM LARGE DOSES OF ANTITOXIN IN THE TREATMENT OF DIPHTHERIA. HANS HECKSCHER, Ugesk. f. Læger **88**:1167, 1926.

Of 1,113 patients suffering from diphtheria, 15 per cent had severe attacks and these patients were given antitoxin in doses of from 200,000 to 300,000 units over a period of three days. Serum disease occurred in 58 per cent of the patients. The larger the dose of antitoxin the more frequent the number of reactions. The older the patient, the more frequent the reaction. Also, serum disease developed more often from intramuscular than from intravenous injection.

ATTEMPTS AT PROPHYLACTIC TREATMENT OF "SERUM SICKNESS" BY INJECTION OF PROTEIN (POLYVALENT STAPHYLOCOCCUS VACCINE). HANS HECKSCHER, Ugesk. f. Læger **88**:1169, 1926.

The injection of small doses of staphylococcus vaccine (1,000 million killed bacteria to 1 cubic centimeter) for five days, beginning on the fourth day after giving antitoxin, reduces serum sickness 66 per cent. The vaccine is given in

gradually rising doses from 0.2 cc. up to 3 cc. on the fifth day for patients under 15 years; and from 0.5 up to 5 cc. for older patients.

IMMUNIZATION AGAINST MEASLES WITH SHEEP SERUM. M. SIGGARD ANDERSON, Ugesk. f. Læger **88**:1190, 1926.

Sheep antimeasles serum should be given from seven to ten days after exposure. There is little if any benefit derived if the serum is given immediately after exposure. On the contrary, convalescent serum should be given early and not six or seven days after exposure to get the best results.

From the several small series of cases reported, it may be concluded that sheep serum is of questionable value and often produces reactions, but that convalescent serum does not produce untoward reactions and is of definite value.

SCHLUTZ, Minneapolis.

Chronic Infections

THE EFFECT OF TREATMENT OF THE SYPHILITIC PREGNANT WOMAN ON THE INCIDENCE OF CONGENITAL SYPHILIS. DAVID L. BELDING, Am. J. Obst. & Gynec. **12**:839, 1926.

A comparison is made in this article between a series of treated and untreated women with positive Wassermann reactions during pregnancy; 190 cases are included in the review.

The time of infection and the element of chance determine in a large measure the incidence of congenital syphilis. Syphilis may be acquired by the child during the antenatal, intranatal or postnatal period. Exacerbation of the disease, local infection of the reproductive tract, abnormalities that lower the protective process of the fetus, and changes in the resistance of the mother are among the factors that determine the infection of the fetus. The more recent the maternal infection, the more infectious. It is rare for a child whose mother has had the disease for five years or longer to be syphilitic. The critical period of infection is just prior to conception or during the first five months of pregnancy.

The statistics in the author's series indicate that about 15 per cent of the women who have abortions or stillbirths have a positive Wassermann reaction. Also, 1.47 times as many fatalities occur in children of serum-positive syphilitic women as those of nonsyphilitic; 3.87 times as many in those in which clinical syphilis is present.

In 374 untreated patients with positive serum reactions, 60 per cent of the children were apparently healthy.

Cholesterolized antigens gave more accurate results during pregnancy than uncholesterolized.

In 150 women with positive reactions who did not receive antisyphilitic treatment during pregnancy, 61.3 per cent of the conceptions resulted in living, apparently healthy, nonsypilitic children controlled up to 4 years of age.

In eighty-seven, who in addition showed evidence of clinical syphilis, 47.4 per cent were healthy, and in sixty-three, who had only a positive serum, 87.4 per cent showed no evidence of syphilis.

A group of forty women with clinical syphilis was treated during pregnancy. Living, apparently nonsyphilitic children resulted in 67.5 per cent of the conceptions.

A CASE REPORT. SPIROCHETAE IN THE THYMUS GLAND. JAMES R. MCCORD, Am. J. Obst. & Gynec. **12**:890, 1926.

Spirochetae in large numbers were found in the thymus gland by Levaditi's method. Sections of the placenta, liver, spleen and other organs stained at the

same time by the same method did not reveal any evidence of syphilis. Roentgenograms of the fetal bones did not show any abnormality. The maternal prelabor Wassermann reaction was negative. The child weighed 4 pounds, 1 ounce (1,842 Gm.) and was born dead.

ALLEN, Chicago.

TUBERCULOSIS DACTYLITIS IN INFANCY. G. HERZFELD and M. TOD, Arch. Dis. Childhood **1**:295 (Oct.) 1926.

From 1920 to 1924 inclusive, 1,403 tuberculous patients attended the surgical outpatient department of the Royal Edinburgh Hospital for Sick Children. Ninety-seven of these had tuberculous dactylitis. Most of these infections were assumed to be bovine. The small bones of the hands, feet and spine were most often affected. Twenty-four patients were operated on—ten of the operations were amputations. Except in severe cases, recovery is often so complete that it is later difficult to find the lesion.

PETERMAN, Milwaukee.

EXPERIMENTAL STUDY OF THE HEREDITY OF SYPHILIS IN RABBITS. P. UHLENHUTH and H. GROSSMANN, Med. Klin. **23**:18, 1927.

Pregnant female animals were injected intravenously with spirochetes. The experiments gave the following results: The presence of spirochetes in the maternal blood for itself does not seem to decide about the intra-uterine transmission of experimental syphilis of rabbits. In two cases in which thorough infection of the maternal body was assured, even a latent infection could not be shown through inoculation of organs and glands. A congenital transmission of syphilis through the sperma of syphilitic animals could not be found in any one of three cases. For an intra-uterine transmission of syphilis the general infection of the mother seems to be necessary, and probably the amount of spirochetes in the blood is of significance. The experiments seem to show that besides the possibility of contact between maternal and fetal blood, there are other factors that play an important part. It may be that the placenta is not always permeable for spirochetes or that the fetus does not become infected in spite of the presence of spirochetes. It is not probable that in both negative cases demonstration of a latent infection would have failed if it had been really present. It is also possible that conditions in different stages of pregnancy are different. These experimental results naturally do not permit any comparison with human congenital syphilis. The experiments of this type, even though one would not consider that conditions in every case are unnatural, do not permit any conclusions in application to man. The pregnancy of rabbits lasts only three or four weeks, and the biologic and physiologic conditions are so different that experimental results have to be taken with a great amount of reservations as to parallel conditions in man. A great deal has been learned about human syphilis and its treatment through animal experiments, but in spite of it one cannot expect too much from the study of heredity of syphilis through experiments in rabbits.

ZENTAY, St. Louis.

EXPERIMENTS WITH CALMETTE'S BCG CULTURE. RUDOLPH KRAUS, Wien. klin. Wchschr. **40**:49 (Jan. 13) 1927.

The author presents his own and other experimental evidence to prove that only a tuberculous process which has been evoked by living, virulent tubercle bacilli can establish an immunity toward tuberculous reinfection. Calmette, however, has claimed to have secured immunity in animals and in infants by use

of a completely avirulent strain of bovine tubercle bacilli which he has named BCG. Calmette's method of prophylaxis is now being widely employed in France and other European countries, and startling reductions in mortality from tuberculosis are claimed, from its use both in animals and in infants. In order to determine experimentally whether or not Calmette's culture is really avirulent as he has maintained, Kraus injected BCG into the peritoneal cavities of guinea-pigs. On killing the animals at the end of eighteen or thirty-four days tuberculous changes and acid-fast bacilli were demonstrable in the spleen, lymph glands, and other organs. A pathologist thought that in some of the animals the lesions resembled those which are produced by injection of dead tubercle bacilli. However, control experiments with a killed culture of BCG gave negative results. When the animals were killed at a longer interval after injection (from forty to sixty days) the pathologic processes mentioned above displayed a markedly retrogressive appearance.

Kraus concludes that BCG possesses a definite though slight degree of virulence which is responsible for its apparent ability to immunize. It produces tuberculous lesions of a benign and localized character which persist for only a brief time and subsequently heal. He states that other investigators have reached similar conclusions. He cautions against a too early general adoption of this method of prophylaxis.

OLMSTEAD, Seattle.

Internal Diseases

A CLINICAL STUDY OF CONGENITAL HEART DISEASE IN CHILDHOOD. EDITH I. M. IRVINE-JONES, Am. Heart J. **2**:121 (Dec.) 1926.

The author believes that, while much study has been made in the autopsy room, little attention has been paid to the symptomatology during life. Few have studied the reactions of the congenital cardiac patient to normal strain in life or to extra strain of disease, and relatively little is known of the significance of the occurrence of cardiac anomalies in a family. The study is based on 100 cases examined during the last ten years. Forty-five patients are known to be alive; twenty-nine have died, and the fate of the remaining twenty-six is unknown. Boys were slightly more affected than girls. In evaluating the symptoms, two features stood out: (1) cyanosis, in thirty-one infants, and, (2) the nutritional difficulties. In late life cyanosis is perhaps the most common symptom. About 10 per cent showed this in varying degrees. Forty-five per cent of the cyanotic patients were blue babies within the first three days. The highest mortality occurred among the slightly cyanotic children. Arrest of development is, however, usually associated with cyanosis. Next to cyanosis comes dyspnea, which was observed in forty-eight cases. Twenty-nine cases showed a definite subnormal mentality. Seven were mongoloid. The average age at which clubbing occurred was 5½ years. There was not any instance of neonatal clubbing. Syncope occurred in fourteen cases. Angina was a symptom in fourteen cases. Of the physical symptoms the most common and least useful from any standpoint is murmur, which was present in 90 per cent. There were 54 per cent with congenital anomalies elsewhere. Thirteen per cent of the mothers were ill during pregnancy. In 33 per cent the first child was affected. The feeding schedule should be arranged to give small amounts of high caloric value. Tonsils, if diseased, should be removed. Prevention of cold and exposure are important. Exercise is not advisable until the child is gaining weight and feeling well. The author does not consider digitalis of any value. When great disability is present special teaching should be instituted.

CLINICAL ASPECTS OF CONGENITAL ANOMALIES OF THE AORTA. JOHN T. KING, JR., Am. Heart J. **2**:144 (Dec.) 1926.

A case is reported in which the signs of generalized hypoplasia of the aortic arch were present: cardiac hypertrophy without demonstrable valvular myocardial or pericardial disease; myocardial insufficiency, small pulse and aortic shadow on the roentgenogram. This case is characteristic of hypoplasia of the aorta as described in clinical and pathologic reports.

A typical instance of stenosis of the isthmus of the aorta is reported in a young woman; the chief signs were collateral arterial circulation, increase of pulsation and of blood pressure in the arms, and decrease of both in the legs with characteristic murmurs. Cardiac palpitation, precordial pain and intermittent claudication in the legs were the chief symptoms.

MANNING, Santa Barbara.

ROENTGEN RAY STUDY OF BRONCHIECTASIS. J. J. SINGER and E. A. GRAHAM, Am. J. Roentgenol. & Radium Therapy **15**:54 (Jan.) 1927.

After a careful study of the history and physical signs, roentgenograms were taken in three positions, the anteroposterior, the posterio-anterior and the horizontal, either anterior or posterior, but sterescopic plates were not feasible in all cases. Diagnostic pneumothorax was of value in elevating the bronchiectatic area away from the cardiac shadow and gives an idea as to which lung is more diseased. Repeated pneumothorax was used therapeutically in some cases with good results. Bismuth or iodized oil 40 per cent are regarded as not necessary for diagnosis; they may block smaller bronchi and act as a foreign body complication. Postural drainage is recommended, and subsequent plates should be made for information as to relative size of bronchiectatic areas. Diagnosis of atelectatic bronchiectatic lobes can be made before operation.

DEMONSTRATION OF THE BRONCHIAL TREE BY INTRATRACHEAL INJECTIONS OF LIPIODOL. HENRY W. GRADY, Am. J. Roentgenol. and Radium Therapy **15**: 65 (Jan.) 1927.

The demonstrable lesions after injection of 40 per cent iodine by weight in vegetable oil are deviations of the trachea and bronchi, modifications of the permeability of the bronchial area, bronchial dilatation, pulmonary cavities and bronchial and pleural fistulas. Bronchiectasis is clearly demonstrable even when lesions are obscured by the heart shadow or a pleuropulmonary fibrosis, and which may not show any deviation in routine plates. Armand and Delille, by injecting through the crico-thyroid membrane, were able to demonstrate bronchiectasis in children who presented suggestive signs of tuberculosis. Diagnoses of bronchiectasis, bronchial dilatation, interlobar empyema opening into a bronchus, pulmonary abscess and open hydatid cyst were made. In frank tuberculosis injections should not be made because of the possible harmful effect of the iodine; one case presented signs of asphyxia with ultimate recovery; two patients showed slight signs of iodism and one, iodism with edema of the larynx. Preliminary investigation to determine susceptibility to iodine is suggested by Boidin. Most of the iodized oil 40 per cent is eliminated by coughing within a few hours. Bronchoscopic control of the injection in the supraglottic method is advocated by some.

STULIK, Chicago.

COMBINED ACROCEPHALY AND SYNDACTYLISM OCCURRING IN MOTHER AND DAUGHTER. A CASE REPORT. A. A. WEECH, Bull. Johns Hopkins Hosp. **40**:73 (Feb.) 1927.

This is a report of two cases, with photographs, of acrocephaly associated with syndactylism occurring in members of the same family. These cases support the view of Park and Powers that the malformations are evidences of defects of germ plasma rather than the result of externally operating causes.

SICKLE-CELL ANEMIA. HUGH W. JOSEPHS, Bull. Johns Hopkins Hosp. **40**:77 (Feb.) 1927.

This is a report on the behavior of the red cells in six cases of sickle-cell anemia. Clinical details of the case are not given.

Oxalated venous blood was used, and red cells were counted immediately after drawing the blood. The blood was centrifugalized and washed six times with unbuffered salt solution. It was found that the red cells were not destroyed by the washing and that the abnormal cells resumed their normal shape. When the washed cells were put in the salt solution used for washing red cells of either normal children or children with sickle-cell anemia, they reassumed abnormal forms to the same extent as originally. But if the cells were replaced in plasma they did not reassume abnormal forms. The author explains this as a phenomenon of adsorption. An unknown substance common to all blood plasma is adsorbed on the red cells and removed from the plasma. This substance can change the shape of some of the red cells from patients with sickle-cell anemia. It tends to remain attached to the cells in the presence of plasma but can be washed off them in salt solution when the cells regain their normal shapes. But if the cells are allowed to stand sufficiently long in the salt solution that contains the unknown substance adsorption again takes place with redevelopment of the abnormal forms. The nature of this unknown substance is still to be determined.

LYTTLE, New York.

BRONCHIECTASIS IN CHILDHOOD. WILLIS S. LEMON, M. Clin. North Amer. **10**: 531 (Nov.) 1926.

Sixty-three cases of bronchiectasis were found among 15,500 children examined at the Mayo Clinic. Except in rare instances, the disease is secondary to infectious processes arising in the bronchi, lungs or pleura. Intrinsic injury of an inflammatory character was found to be the cause in all cases in this series. These changes were not limited to the lower lobes, but occurred in any portion of the lungs or bronchial tree, and involved the sustaining coats of the bronchi as well as its mucosa.

Serious respiratory infections are of such frequent occurrence in childhood that the determination of the causative factors in the individual case is difficult. Responsibility must in many instances be divided among several possible causes. Whooping cough seemed to be the most frequent precursor in this series, followed by measles, influenza, frequent colds, pneumonia and infections of the nose, throat and accessory sinuses. Whatever the primary factor or factors, bronchiectasis is the end-result of deep seated infection in the bronchial wall, associated with secretion and increased bronchial pressure from cough. A large number of cases were found associated with infections of the upper air passages, but it was not possible to determine whether such infection bore a causal relationship to the disease. The most that can be said at the present time is that these diseases are fundamentally infectious and related, but not necessarily in ordered sequence.

The most typical symptom is the cough, loose, persistent and productive. In the earlier stages it may occur paroxysmally, especially on change of position, and with little secretion. Young children swallow their sputum, and its amount and character may become evident only when the patient is inverted or vomiting occurs. It may be mucoid, mucopurulent, purulent or hemorrhagic. Not any other disease of the lungs or bronchi produces hemorrhage more frequently than bronchiectasis.

In the order of their frequency, the complications found were repeated colds, bronchitis, pneumonia and affections of the pleura. Abscess of the lung was the most infrequent complication. Two cases of tuberculosis were demonstrated by the roentgen ray, but there was not any evidence of active disease.

The pathologic changes vary with the extent and duration of the disease. In bronchiectasis the injury is essentially to the bronchi, always produced by inflammation in their walls and always resulting in ectasis. Early cases show an inflamed and swollen mucosa, with increased mucous secretion. Later the mucosa becomes paler, and may in places be denuded and replaced by granulation tissue, or may be folded on itself, presenting a villous appearance. Fibrous changes with destruction invade the walls of the bronchi toward the periphery, involving the alveolar walls, interlobular septums and the pleura.

Since pure bronchiectasis rarely exists, clinical signs vary with the associated lesions. Auscultation reveals nonconsonating râles of medium or coarse character, sometimes unilateral, but usually bilateral, which may vary with cough or change in position. Signs of cavitation may be present, as well as the characteristic symptoms of pleural involvement. Deformities of the chest frequently occur with advancing disease. Complicating pneumonia is easily overlooked if too great dependence is placed on physical signs, and such significant symptoms as rapid breathing, high fever and leukocytosis are overlooked. Clubbing of the fingers and toes is found almost universally in long standing cases, but may occur early in the disease.

The roentgenologic diagnosis of intrapulmonary disease may be rendered difficult by the presence of thickened pleura, fluid, or by the heart on the left side. In seventy-one such examinations, a positive diagnosis of bronchiectasis was made twenty-nine times. In twenty-six other cases, bronchial thickening, or thickening suggestive of the condition, was found. Injections of iodized oil 40 per cent were not often made in this series, examined between 1920 and 1925.

Finally, it was determined that the physical fitness of the children of this group was seriously impaired, and even those less severely affected were stunted in growth, impaired in strength, susceptible to epidemic infection, and handicapped for happy and productive life.

SMITH, Ogden, Utah.

DISTRIBUTION OF ENDEMIC GOITER IN THE UNITED STATES AS SHOWN BY THYROID SURVEYS. ROBERT OLESEN, Public Health Reports **41**:48 (Nov.) 1926.

Generally speaking, the incidence of endemic goiter among men examined for military service during the World War is greater in the Pacific Northwest and in the Great Lakes Basin, and the distribution of goiter in the United States, as disclosed by numerous thyroid surveys, parallels the goiter incidence among drafted men. Individual thyroid surveys disclose foci of endemic goiter in localities not previously regarded as being located in goitrous territory.

There are manifestly wide variations in the methods of determining thyroid enlargements. The classifications of various degrees and types of involvement

also range within wide limits. Uniform procedure is a necessity if observations in different sections of the country are to be compared. Based on incidence, wholesale prophylaxis for endemic goiter is apparently not required in all states. Resurveys are desirable for the purpose of learning the extent and character of changes occurring either under natural conditions or after widespread prophylaxis has been instituted.

BUHRMAN, Chicago.

A CONGENITAL CASE OF KALA AZAR. W. E. COOKE, Lancet **211**:1209 (Dec. 11) 1926.

An infant was born in England of a mother suffering from kala azar acquired in India. The confinement was normal; the infant was never nursed by the mother and was kept in a room apart from her. The first fortnight, the infant did well; it then had a convulsion and seven weeks later had diarrhea.

Seven weeks after the birth of the child the mother was admitted to the hospital for the kala azar; she was treated with a proprietary antimony preparation and was discharged cured after eleven weeks.

At the age of 1 year, the infant was admitted to the hospital with marked anemia and an enormously enlarged spleen, which showed Leishman-Donovan bodies on puncture. Intramuscular injections of a proprietary antimony preparation were given with good results. The author speculates on the various routes of infection and concludes that in this case the disease was conveyed through the placenta. However, just as the paper was going to press the mother had a relapse, showing Leishman-Donovan bodies on splenic puncture. This again raised the question of transmission by direct contact.

LANGMANN, New York.

CARDIAC ARRYTHMIA IN CHILDHOOD. J. HUNTER P. PATON, Edinburgh M. J. **34**:1 (Jan.) 1927.

The author has found from the study of the pulse and respiratory tracings taken from girls in a school that he can substantiate Mackenzie's opinions regarding physiologic arrythmia in youth. Cardiac irregularity is always present in healthy youth; it varies with the phases of deep respiration and disappears during acute febrile disease, to recur in convalescence. In this paper, Paton stresses the importance of absence of arrhythmia as a symptom of disease, agreeing with Mackenzie that such disappearance is an evidence of a continued active toxic process.

In routine examination of healthy school girls during the past five years, Paton found that when the heart and lungs were auscultated during deep, slow breaths, cardiac irregularity dependent on respiration was easily detected. Arrhythmia is always present when the well child is recumbent, and nearly always when upright. Only four girls among 500 from 8 to 18 years of age had a disappearance of irregularity of the heart, and these four were found to have some acute febrile disturbance. The author quotes McCrudden's observations in 100 cardiorheumatic children, eighty of whom, in good condition and recovering, had arrhythmia; the remaining twenty, still ill, did not have any irregularity.

Paton devotes several pages to the discussion of the hitherto unproved mechanism for respiratory arrhythmia. He believes that it is dependent on the rate of the sino-auricular node that is controlled by both vagal and sympathetic influences. These impulses probably come from vagal receptors in the abdomen and from sympathetic receptors in the lung. The absence of irregularity in young patients indicates "the action of a toxin on the node or on some portions of the arcs concerned in the balanced reflex."

NEFF, Kansas City.

THE STUDY OF BLOOD PRESSURE IN CHILDREN. L. GAROT and MLLE. SCHWERS, rev. Franç. de pediat. **2**:36 ,1926.

The authors point out that there has been little uniformity in the method of taking blood pressure in infants and children, and that factors other than the actual pressure in the vessels may be responsible for the conception that the blood pressure is relatively low in the infant and increases with increasing age. Many factors tend to cause an overestimation of the blood pressure, such as the presence of much soft tissue, muscular development, increased resistance of the vessel wall and also the application of the blood pressure cuff to a truncated surface.

Studies were made on children ranging in age from 11 months to 13 years. Various types of blood pressure apparatus were used with varying methods of application. The results are expressed graphically and show marked differences according to the type of apparatus used and the method of application. The authors consider that the oscillometer of Pachon is the most accurate instrument, and that it should be applied to the lower third of the leg in children under 6 years and to the arm in those over that age. The figures thus obtained are not much below those found in the healthy adult.

From these observations, it would seem that the opinion that the actual blood pressure increases with increasing age is no longer tenable.

LESLIE, Chicago.

DOLICOSTENOMELALGIA. A NEW SYNDROME? LUIS CALVO, Arch. Chilenos de Pediat. **3**:165, 1926.

The author presents a detailed study of a peculiar condition which he believes differs from anything heretofore described.

A girl, aged 11, became ill with violent pains in the head, for periods of from four to six days, lasting three months. After about six months, the limbs became painful and swollen; this was more noticeable at the joints. The shoulders were not involved. There was not any elevation of temperature, but the patient was unable to walk and sleep well. Later, the hands and feet lengthened, and the fingers and toes became thin and pointed. The roentgenogram showed considerable elongation of the metacarpals and phalanges, without any thickening. The feet were not as much affected as the hands.

The skin became roughened and was violet during a pain. There was limitation of movements of the joints of the extremities because of tightening of the skin and soft parts on the flexor surfaces. Passive movements were painful and caused the flexor tendons to stand out like cords. Muscular force was only a little diminished. The tendons and the articular eminences stood out prominently because muscular growth had not kept up with the skeletal lengthening. The fat was abundant on the trunk but sparse in the extremities. The frontal bone had a depression that dated from birth, and microcephalus and brachycephalus were noted. The ramus of the lower jaw was abnormally large. The blood and cerebrospinal fluid Wassermann reactions were negative. The special senses, the heart, lungs and urine were essentially normal.

This condition resembled one described by Marfan in 1896, which he called dolicostenomelia, but which is always congenital and unaccompanied by pain.

Achard reported a case of aracnodactilla, in 1902, that somewhat resembles this condition.

In the author's case the condition was acquired, the pains beginning only six months before he observed it and ceasing spontaneously. He discusses the

differential points between this syndrome and chronic rheumatic ankylosis, acromegalia, Paget's disease, partial gigantism and erythromegalia.

DWYER, Kansas City.

SPORADIC CRETINISM. F. THOEMES, Jahrb. f. Kinderh. **110**:167 (Oct.) 1925.

By the term cretinism is understood the end-effect of a chronic disease characterized by dwarfism, idiocy, deafness, and goiter. However, there are many transitions from this extreme to the half-cretin and the cretinoid toward the normal. Endemic cretinism and thyroid disease are commonly associated. Sporadic cretinism, first described in 1870 by Hilton Fagge, was considered an athyreosis and since his time all forms of congenital and infantile myxedema have been considered under the head of sporadic cretinism especially by those men who consider endemic cretinism as a pure athyreosis. Scholz considers infantile myxedema and sporadic and endemic cretinism as distinct. Infantile myxedema does not occur in goiter areas, and the characteristic changes of the skin seen in this condition are not seen in cretins. Myxedema clears up promptly on thyroid treatment; this is of great diagnostic importance. A case of sporadic cretinism is described in which dwarfism with overweight in proportion to height, cretinoid facies, normal skin, dry hair, pot belly, deafness and dumbness, normal sugar tolerance test as well as normal reaction to atropine, thyroid medication and epinephrine were the important observations along with lymphocytosis and eosinophilia in the blood. Myxedema, lack of perspiration, obstipation, lowered body temperature, increased tolerance for sugar, atrophine, and epinephrine and late appearance of the bone nuclei were not present. There was also a strong susceptibility for thyroid extract, showing that the case was not an athyreosis. Thoemes considers the case more closely allied to endemic cretinism than to congenital myxedema.

EHRMANN, Chicago.

HYPOGLYCEMIA WITH FATAL RESULTS. A. HEIMANN-TROSEIN and H. HIRSCH-KAUFMAN, Klin. Wchnschr. **5**:1655, 1926.

These authors report an instance of hypoglycemia in a girl, aged 8 years. In previous hypoglycemic reactions, they had found favorable response to the usual measures. In this instance, neither intravenous glucose nor epinephrine was of any avail. They note a greater variability in the insulin needs of childhood. It is frequently necessary to divide the total day's dosage into several smaller, frequently repeated doses.

SCHWARTZ, Milwaukee.

COAGULATION OF THE BLOOD IN DIFFERENT DISEASES OF CHILDREN. J. CSAPO, Orvosi hetil. **70**:1030, 1926.

The author worked out a new method for the examination of the coagulability of the blood. His method is the addition of different concentration of potassium iodide solution to a constant amount of blood in small test tubes. The coagulation is read after from sixteen to twenty hours, and the concentration of the potassium iodide solution that is necessary to prevent coagulation is used as an index to coagulability. The results are that the coagulability of the venous blood does not show any marked changes in most of the diseases, with the exception of hemophilia and Werlhof's disease. The venous blood requires a lower salt concentration than the arterial blood to prevent coagulation.

THYMUS AND EXUDATIVE DIATHESIS. J. J. VAS, Orvosi hetil. **70**:1116, 1926.

Roentgenograms of the chest of children with exudative diathesis were compared with a group of control cases. It was found that those with exudative diathesis show a wider shadow in the region of the thymus gland than the control cases.

ZENTAY, St. Louis.

Nervous Diseases

MICROCEPHALIC CHILDREN. T. BRUSHFIELD and W. WYATT, Brit. J. Child. Dis. **23**:265 (Oct.-Dec.) 1926.

According to the authors, the diagnosis of true microcephaly rests on three distinguishing and never varying features:

1. Cranial measurements all below normal.
2. Frontoparietal recession with occipital flattening.
3. Dwarfism.

To which may be added:

4. Early closure of the anterior fontanel and all sutures.
5. A pointed, ridged vertex, the ridge in marked cases extending down the frontal bone to the glabella.
6. Recession of the chin and prominent nose.

Of 1,185 mentally defective children under 18 years of age, 147 had a skull circumference of 17½ inches (51.5 cm.) or less. Of these 147 cases, however, only seventy exhibited the special features of microcephaly. Measurement alone is not sufficient for diagnosis, but the shape of the skull must be taken into account. Of the true microcephalic patients the majority of the family histories showed pronounced neuropathic stock.

LANGMANN, New York.

THE RELATION OF THE CAECUM-ASCENDING COLON CONTENT TO IDIOPATHIC EPILEPSY. G. E. ARMSTRONG, Practitioner **117**:288, 1926.

The view that idiopathic epilepsy is a disease of the brain is being challenged. Oppenheim believes epilepsy to be a toxicopathic condition with cerebral manifestations, and Collier regards the disease as a metabolic dyscrasia.

In one patient, a girl, aged 11 years, there had been attacks for the past four years. The child had always been constipated, and for eight months had had a severe colitis. Under starvation, the attacks stopped altogether. There was roentgen-ray evidence of general ptosis and colonic stasis. In April, 1924, the cecum and ascending colon were removed. The end of the ileum was joined to the transverse colon. Two years later, the condition was satisfactory. There have been no convulsions since ten days after operation. She has gained 40 pounds (18.1 Kg.), has returned to school and has shown remarkable improvement in her mental capacity.

Little is known regarding the chemistry of the content of the cecum and ascending colon. It is most probably a problem in bacteriology and chemistry and their influence on metabolism.

Major abdominal operations are not to be lightly considered or lightly undertaken, but there may be cases of idiopathic epilepsy in which, all other measures of relief having failed, they may be legitimately recommended.

GELSTON, San Francisco.

ESSENTIAL CONVULSIONS OF INFANCY. HEUYER and LONGCHAMPT, Arch. de méd. d. enf. **29**:617, 1926.

Among diseases of children few symptoms are more commonplace than convulsions. Their significance, however, may be questioned. In France, two theories are advanced: one, favored by such writers as Rilliet, d'Espine and Barthez, maintains that convulsions may simply be one of the phenomena noted in the progress of a given disease of infancy, of no special influence in the origin of epilepsy. The contending school, in which are found such advocates as Pierret, Feret and Jaffroy, believe that the essential convulsions of infancy are the first manifestations of epilepsy, beginning with divers infections or intoxications and later betraying genuine lesions of the central nervous system in true epileptic reactions. The intensity of these lesions will control the forms and the frequency of the convulsions, but the seizures themselves must be identified as an equivalent to the epileptic crises of adults.

Recently an attempt has been made by Collin and Revon to differentiate, among the convulsions of infancy, the tonic, frequent and severe forms from the rarer clonic and benign varieties. They believe that the former always indicate a severe lesion of the central nervous system and are followed by grave sequelae while the latter are of transient interest only. From the point of view of etiology, syphilis, especially the inherited form, continues to play an important rôle. Escherich, Chvostek and Thiemich have expressed the opinion that tetany parathyreopriva is probably responsible for the majority of convulsions in infants beyond 3 months of age, while Lesné and Turpin advance the opinion that two thirds of the convulsions found at this age are spasmophilic in character. Heuyer and Longchampt, in this comprehensive study, have followed their cases for seven years in an open minded endeavor to arrive at the facts. These cases originated both in the clinic and in private practice, numbering in all seventy-one infants. The authors' intensive observations in these cases lead them to believe that convulsions must be interpreted as a manifestation of a lesion in the cerebrospinal system and constitute in consequence a serious factor in prognosis.

FURTHER STUDIES ON MONGOLISM. J. COMBY, Arch. de méd. d. enf. **30**:5 (Jan.) 1927.

Landon Down of London first distinguished (1866) mongolian imbecility from other forms of mental deterioration, the chief characteristic being the Asiatic facies, constant and with little variation in every case. Comby has studied ninety-five cases since March, 1904. Prior to that time, strange as it may appear, not any cases were reported from the Latin countries, although at least 10 per cent of all idiots everywhere are mongolians. Males and females are about equally divided. There may be two or more cases in the same family, but the disorder must be considered congenital rather than hereditary or familial. Syphilis and alcoholism have been definitely excluded as etiologic factors. Many cases have been recorded in families in which the mothers are far past the usual child bearing period or in which many years have elapsed between pregnancies. The privations incident to the late war have almost doubled the number of mongolians in certain districts. Postmortem studies of these individuals invariably show faulty development of the brain, with convolutions less sinuous than found in the normal brain and separated by shallow fissures. Comby discusses at length the well known symptomatology and the various factors affecting the prognosis, and stresses all those features of differential diagnosis so familiar to American pediatricians.

AMESSE, Denver.

THE VALUE OF ROENTGEN RAY AND DIATHERMY IN THE TREATMENT OF ACUTE ANTERIOR POLIOMYELITIS. E. CASTRONOVO, Pediatria **35**:57, 1927.

In cases of acute anterior poliomyelitis Castrovono obtained the following results with the therapeutic measures employed:

Two patients were treated with the galvanic current alone; one was cured, the other improved.

Fourteen patients were treated with the roentgen-ray alone; there were four cures, six bad results and four improvements.

Ten patients were treated with roentgen ray and diathermy; there were two cures, four bad results and four improvements.

The author modestly refuses to draw definite conclusions, but makes a few observations: there were not any notable differences between the roentgen ray alone, the roentgen ray and diathermy combined, judging by the results obtained; there were failures in very early cases, and excellent results in some advanced cases; diathermy is extremely efficacious when there is a hypothermy of the affected limbs. Diathermy, however, did not have any curative value when paralysis had set in. In those cases in which excellent results were obtained, the clinical picture was essentially that of cases that tend to a spontaneous cure. Galvanization, though slow, is efficacious, and merits more attention than it has had lately. Roentgen-ray therapy of infantile paralysis is beneficial only when the paralysis is the result of edema; here, by restoring normal circulatory balance, cells are brought back to normal, the vitality of which had been precarious. There were not any untoward effects from the therapy employed.

SALA, New York.

CARDIAC HYPERTROPHY AND DEGENERATIVE CHANGES IN THE SYMPATHETIC NERVOUS SYSTEM IN SPASMOPHILIA. P. REYHER, Klin. Wchnschr. **5**:1879, 1926.

In an infant, aged 11 months, who died of spasmophilia, rachitis, pyelonephritis and double pneumonia, there were found, along with other pathologic changes, the same degenerative changes that have been described in beri-beri. This is the first report of such change having been encountered in spasmophilia.

SCHWARTZ, Milwaukee.

Diseases of the Eye

POINTS ON THE TREATMENT OF PHLYCTENULAR CONJUNCTIVITIS. JAROMIR KURZ, čas. lék. česk. **64**:1090 (July) 1925.

Phlyctenular conjunctivitis was found in 12 per cent of the children of the eye clinic in 1912 and in 18.4 per cent in 1918. In several series of cases of blindness, primary optic scrofula is cited in from 6 to 17.4 per cent. Phlyctenular conjunctivitis is regarded merely as one symptom of generalized disease, and requires more than local measures. The hygienic and dietetic regimen is to include frequent bathing, cleansing of eczematous skin, combing, and rations of fresh vegetables and cod liver oil given under proper dietary discipline. The local treatment is symptomatic and varies from 1 per cent yellow oxide of mercury to 5 per cent silver nitrate. Perinasal eczema, adenoids, otitis media and infected scalps, following pediculosis and simple and infected eczema, must be corrected before the conjunctivitis can be completely healed. Some of the cases responded to intramuscular injection of Lactin, a protein preparation, especially where blepharospasm and hypersecretion were present.

STULIK, Chicago.

Diseases of the Ear, Nose and Throat

MASTOID INFECTIONS IN INFANTS. ARTHUR M. ALDEN, Arch. Otolaryngol. **5**: 39 (Jan.) 1927.

The author calls attention to the fact that acute infection of the middle ear may exist in the infant without redness or bulging of the drum, drainage of the abscess occurring through the relatively larger and shorter eustachian tube. Mastoiditis may occur with or without subperiosteal abscess. The author supports Marriott's contention of the causal relationship between a mastoiditis and cholera infantum.

LESLIE, Chicago.

NASAL SINUSITIS AS A CAUSE OF TOXEMIA. WILLIAM WILLCOX, Practitioner **117**:137 (Sept.) 1926.

Nasal sinusitis is relatively common and should always be suspected in cases of toxemia of all kinds when the cause is not apparent. Effects may be far-reaching and may cause many diverse etiologic conditions. Operative treatment is often required but should not be too radical in chronic cases.

GELSTON, San Francisco.

CONTRIBUTIONS TO THE STUDY OF FOREIGN BODIES IN THE RESPIRATORY TRACT. B. WISKOVSKY, Arch. Internat. de Laryngol. otol. rhinol. **5**:1062.

The author reviewed twenty cases in which foreign bodies were successfully extracted from the air passages, with one mortality. Fourteen of the patients were under 10 years of age. In sixteen instances the foreign bodies were organic. The one autopsy revealed status lymphaticus. Lymphatic children, on account of the inferior physique, the tendency to exudation and the difficulty of respiration, should be regarded with apprehension. The tendency to aspiration is increased in these children on account of mouth breathing, reduced sensibility of the pharyngeal mucosa and the functional insufficiency of the epiglottis. The author cites Brdlik, who found that in 90 per cent of the autopsies he observed following bronchoscopies frank status lymphaticus was present. Aspiration of foreign bodies should also be included among the accidents of dentition.

"When bronchostenosis predominated, our observations were, in brief: A marked difference in the two sides of the thorax was observed in two of thirteen cases. Modification of the respiratory tone in seven of fourteen, auscultatory findings in twelve of fourteen cases, but these are evidently not always due to bronchostenosis. Thirteen cases were examined by the roentgen-ray; results were negative in three cases, in eight there was a modification of the transparency, in four the motility of the diaphragm was limited on the side of the stenosis, in two there was a permanent displacement of the mediastinum to the sound side, and in two others the deviation was to the injured side on inspiration."

Exception was taken to the opinion of some authorities that a certain degree of pulmonary emphysema is due to a tracheobronchitis of inflammatory origin. The author believes that the entrance of the foreign body into the air passages produces a spasm of the musculature of the trachea and bronchus, determining an asthmatoid condition. He cites the absence of an elevation of temperature and the disappearance of the symptoms on removal of the foreign body to support his contention. However, should the intervention be delayed, the inflammatory changes may supervene, and the patient may die.

In two cases in which the obstruction had remained for days the emphysema persisted. This might have been due to the limitation of the blood circulation by the greatly dilatated alveoli or to an inflammatory change which affected resorption. It might also be explained by the fact that air retained in the alveoli soon attains a pressure of oxygen and carbonic acid equivalent to that of the venous blood. Two cases were cited to show that the emphysema is not always due to the valvelike mechanism of the foreign body, typified by an inspiratory dilatation permitting the entrance of air about the foreign body, and the expiratory contraction preventing its escape. In one case a fragment of a cigaret holder with a patent lumen was aspirated, and in another case a flat blade of bone. The obstructed bronchus, on account of its reflex spasm, does not function in its normal manner.

The author observed a case of postendoscopic stenosis by direct laryngoscopy. He noted that the stenosis was not the result of subglottic edema, but was due to a fibrinous membrane. Bacteriologic examination did not show the predominance of any organism responsible for a primary fibrinous laryngitis. The author believed that the membrane was the result of the traumatism incident to the bronchoscopy. In such cases he prefers intubation to tracheotomy. While direct laryngoscopy in dangerously dyspneic patients is not practical, he does not hesitate to intubate. If the patient breathes freely after removal of the tube, and after some hours has a recurrence of the dyspnea, he reintubates. However, if the patient's dyspnea is not relieved after removal of the tube, he believes that tracheotomy should not be delayed. According to the author, intubation should be a valuable procedure in postendoscopic stenosis.

INFERIOR RETROPHARYNGEAL ABSCESS IN A NURSLING. R. RENDU, Arch. internat. de laryngol. otol. rhinol. **5**:1085.

An infant, 12 months old, had been sick for fifteen days with an ordinary infection of the head. A few days after the onset of the infection, the child had difficulty in swallowing and in respiration. The two symptoms increased until the dyspnea became alarming. Two physicians were called; one pronounced the condition angina, the other, bronchitis. When seen by the author, the child presented the appearance of profound infection and some emaciation. There was an extensive cervical adenitis on the right side. Opposite the base of the tongue on the posterior wall of the pharynx was a fluctuating mass, the size of a large nut. The child was removed to the hospital, where, in the Rose position, without anesthetic, the abscess was incised and strenuous suction immediately applied. Rapid recovery followed.

The author considers the inferior retropharyngeal abscess rare, but he believes that the operation is safe when the head is lowered and suction applied to the incision. He prefers this procedure to the external route, and does not think that there is any greater danger of aspiration pneumonia.

ROTH, Kankakee, Ill.

PARACENTESIS, ANTROTOMY AND RADICAL OPERATION IN CHILDHOOD. GUSTAV BRUHL, Jahrb. f. Kinderh. **110**:1 (Sept.) 1925.

Bruhl divides the inflammations of the middle ear into (1) acute and chronic middle-ear catarrh; (2) acute and chronic middle-ear inflammation.

The catarrhal conditions occur commonly in association with constitutional anomalies as, for instance, exudative diatheses in whose course there is an

hypertrophy of the lymphatics of the pharynx. The acute middle ear infections are characterized clinically by being entirely painless and free from fever and are often found accidentally. The changes in hearing are usually significant but vary considerably. The drum membrane is unusually glistening, translucent, retracted, the yellow-brown exudate of the middle ear can be seen through it and often has black border-lines. There is not any redness or otorrhea. Therapy consists of treatment of the general constitutional condition, adenoidectomy and tonsillectomy and daily inflations. Paracentesis is necessary when healing does not occur within a week so that the exudate may be blown out through the perforation by inflation.

In acute otitis media, simplex (nonperforation) paracentesis is not necessary. The trouble comes in deciding whether the inflammation is of this type or the more acute perforating type. In any case in which doubt exists, paracentesis should be performed to prevent more severe complications such as mastoiditis and intracranial complications. To wait for spontaneous rupture is not advisable.

Mastoidectomy is indicated in children in acute otitis media when there are intracranial complications or signs of local caries. Otorrhea lasting for several months is not an indication for mastoidectomy; it often clears up under intensive treatment.

Radical operation should be delayed until puberty when there is a definite desire on the part of the child to be cured and the general constitution has improved. During this period of waiting, of course, the child must be observed, and exercise that may cause bruises of the head should be avoided.

EHRMANN, Chicago.

LYMPHATIC RING OF THROAT AS PORTAL OF INFECTION. H. BEITZKE, Wien. klin. Wchschr. **39**:1473 (Dec. 16) 1926.

The entrance to the respiratory and digestive tracts is guarded against the invasion of bacteria by a complete ring of lymphatic tissue that underlies the mucosa of the throat. In places this lymphatic tissue forms visible structures with crypts, identified grossly as the palatal, pharyngeal, and lingual tonsils. The lymphatic ring develops rapidly after birth and functions most actively in early life. In adult life it usually atrophies, its antibacterial function probably being replaced by specific immune processes in the blood. Ordinary lymph glands have afferent and efferent vessels and lymph sinuses; the lymphatic tissue of the throat has only efferent vessels and is devoid of sinuses. Experimental and clinical studies have shown that bacteria entering the throat are first attacked by the mucosal epithelium; if they pass this barrier they are engulfed by the lymphatic tissue; lastly, they may reach and be destroyed in the regional lymph glands (cervical, retropharyngeal, submaxillary). Only the bacteria which have passed these three lines of defense reach the blood stream. Lymphatic tissue which has overcome invading bacteria becomes hyperplastic; if the resisting power against infection has been insufficient the tissue becomes inflamed. The degree of resistance of the host as well as the virulence of the organism may determine the reaction of the lymphatic tissue. Infection by retrograde lymph flow probably occurs only when pus exists under pressure; e. g., in cancellous bone. Thrombosis of the jugular vein complicating phlegmon of the neck is probably caused by direct extension of infection from adjacent lymph glands and not by thrombosis of tonsillar veins.

OLMSTED, Seattle.

Diseases of the Skin

SKIN REACTIONS TO HUMAN SERA. ELIZABETH H. CHANT and LESLIE N. GAY, Bull. Johns Hopkins Hosp. **40**:63 (Feb.) 1927.

1. Unheated homologous human serum causes practically no reaction on intracutaneous injection into human skin.

2. Similar serum heated for thirty minutes or more at 56 C. gives rise to a definite and immediate skin reaction.

3. In most cases the longer the serum is heated at 56 degrees up to two hours, the greater is the reaction.

4. Unheated serum standing at icechest temperature for twelve days or more gives similar positive reactions.

5. Heating the serum at lower temperatures for longer periods has a less marked but similar effect on the serum.

6. Heterologous human serum treated in the same way has a similar action.

7. Guinea-pig serum heated at 56 C. for two hours does not cause skin reactions in the skin of the guinea-pig.

8. Several hypotheses that might account for the variation in the reactions of heated and unheated serums in human skin are presented. It is felt, however, that further investigation is necessary to explain the observations.

AUTHORS' SUMMARY.

CONCURRENT VARICELLA AND HERPES ZOSTER. E. C. WILLCOX and J. D. ROLLESTON, Brit. J. Child. Dis. **23**:27 (Oct.-Dec.) 1926.

Willcox relates a case of a boy, aged 4 years, who developed two well marked patches of herpes zoster and four days later showed vesicles somewhat sparsely scattered on the trunk, face and scalp and also lesions in the mouth, which were identical in character with those of varicella. Both eruptions were extremely characteristic.

Rolleston, in his discussion, cites the cases that have been reported by various investigators of the coincidence of herpes zoster and varicella.

LANGMANN, New York.

ARTIFICIAL SUNLIGHT AND SKIN DISEASE. W. F. CASTLE, Practitioner **117**:258 (Oct.) 1926.

Artificial sunlight, which has had such fantastic claims made for it, now has reached the point when its value is realized. The effect of the rays is first a local antiseptic one, and second, a general stimulation of metabolism.

The skin diseases that are benefited by the use of the rays are sycosis, impetigo, carbuncles, boils and furuncles, and septic areas. In another group alopecia areata, in spite of resistance, is at times greatly benefited. Varicose ulcers are benefited by small exposures on alternate days of two or three weeks. In psoriasis the younger the patient the quicker the results. There are a few cases that are not particularly benefited by the treatment, although occasionally a cure is effected. Results in acne are excellent. This also applies to seborrhea. Roentgen-ray dermatitis and eczema frequently are benefited.

The tuberculous infections are all affected by the rays. Lupus, lichen scrofulosorum, scrofuloderma and the tuberculids are all most suitable for this treatment, although results are slow.

C. F. GELSTON, San Francisco.

INFANTILE ECZEMA. E. LESNE and A. BOUTELIER, Rev. franç. de pédiat. **2**:568, 1926.

In addition to a clinical differentiation of the various forms of eczema, the authors present the histopathologic differences between the common vesicular eczema and the seborrheic form. In the latter the parakeratosis is the more marked while there is little or no incrustation.

In a discussion of the etiology, nothing new is added. Therapeutically, the authors use the sulphonated bitumen, N. F., coal tar and wood tar preparations in the uncomplicated cases. When inflammation is present, they wash with ether and touch with silver nitrate solution. If there is edema, they use moist dressings. As a general measure they recommend a decrease in the fats and, in a breast-fed baby, gradual weaning. Attempts to desensitize with injections of milk have not been successful. On the other hand, they feel that something may be gained by a stimulation of the secretions in the gastro-intestinal tract. They use for this purpose calomel, thyroid and pancreatic extracts. They do not say what effect this has on the general health of the infant. In conclusion, the dangers that attend vaccination and the injection of antitoxin in an eczematous child are emphasized.

LESLIE, Chicago.

THE SKIN AND THE ANTIRACHITIC FACTOR. C. FALKENHEIM, Klin. Wchnschr. **5**:2071, 1926.

Hess and others have shown an increase of the antirachitic factor of skin subjected in vitro to the quartz lamp. To determine the same effect on skin treated in vivo, the author exposed rats to the quartz lamp. Certain portions of the skin were exposed; the other parts were protected. It was found that the exposure increased the antirachitic factor of the exposed parts and to a lesser degree of the unexposed parts.

SCHWARTZ, Milwaukee.

THE TREATMENT OF VERRUCA MANUS WITH CALCIUM SALTS. GRAM, Ugesk. f. Læger **88**:1187, 1926.

The successful treatment of warts with calcium carbonate or calcium phosphate in hydrous wool fat (calcium carbonate 20, hydrous wool fat, 30) is reported in the case of twelve adults and twenty-one children. The therapy is slow. Little change may be noticed the first two or three weeks. The warts as a rule disappear in from four to six weeks. Marks of disfiguration do not remain.

SCHLUTZ, Minneapolis.

Surgery and Orthopedics

ACUTE ABDOMEN IN A BABY. CABOT CASE RECORDS: CASE NO. 13022. Discussion by EDWARD L. YOUNG, JR., Boston M. & S. J. **196**:62 (Jan. 13) 1927.

A girl, aged 10 months, became ill two weeks before admission to the hospital; she was fussy and had fever and vomiting. The abdomen showed marked distention, and after an enema, was found to be more spastic in the right lower quadrant than in the left. The child flexed the right leg over the abdomen and cried when it was extended. Rectal examination showed a fluctuant mass over the right lower quadrant. Blood examinations showed from 23,300 to 15,600 leukocytes and from 38 to 39 per cent polymorphonuclears. The temperature

was from 101.9 to 105.1, the pulse from 150 to 210, and respirations from 80 to 160. The child became pulseless during the operation and died that night.

Anatomic diagnosis at post mortem showed a gangrenous appendix with perforation and purulent peritonitis. This was thought to have been the youngest patient having appendicitis admitted to the Massachusetts General Hospital.

GENGENBACH.

INVESTIGATION OF A CASE OF HENOCH'S PURPURA TREATED BY SPLENECTOMY. BERNARD MYERS, RODNEY MAINGOT and A. KNYVETT GORDON, Brit. J. Child. Dis. **23**:241 (Oct.-Dec.) 1926.

A girl, aged 6 years, was first seen in July, 1926, showing distinct pallor, marked general irritability and slight puffiness around the eyelids; otherwise the physical examination was essentially negative except that the "spleen was palpable." She gave a history of having had a swollen, black and blue ankle joint and swollen knee ten months previously, followed by purpuric spots on the legs and arms and later on the face, then abdominal pain and finally hematuria which persisted up to the time of splenectomy. On admission, the blood platelets numbered 146,500 per c. mm.; two weeks later, there were 300,000, and a month later (just before splenectomy) "only two platelets were seen in the entire slide." A week after splenectomy was performed, there were 200,000 per c. mm. Blood coagulability was slightly increased, but bleeding time was not prolonged. According to the authors, "the case seemed to be a fairly typical one of Henoch's purpura with resulting persistent hemorrhage from the kidneys."

The spleen weighed 60 Gm. and on section was markedly paler than normal. The malpighian bodies were normal; the splenic pulp was markedly fibrotic, and there was marked proliferation of the endothelial cells of the splenic pulp. Numerous multinucleated giant cells were present in the pulp.

Two months after splenectomy the patient is reported as in good condition.

LANGMANN, New York.

INTESTINAL INVAGINATION IN INFANTS. ARTURO SCROGGIE, Arch. Chilenos de Pediat. **3**:176, 1926.

Scroggie states that intussusception is relatively uncommon in Latin countries. In a period of six years at the Roberto del Rio Hospital in Santiago, he saw only six cases, while during a period of six months at the New York Post-Graduate Hospital he saw twelve cases.

The explanation for this is obscure but has been attributed to early artificial feeding and especially the use of thick cereals in Anglo-Saxon countries.

In from 80 to 85 per cent of the cases, the invagination begins in the ileocecal region. The head of the projecting portion is almost always the valve of Bauhin. Meckel's diverticulum, worms, extraneous bodies and drastic purgatives are predisposing causes.

Scroggie reports a patient, aged 18 months, who became suddenly ill at about 11:30 a. m., with pallor, sweating, severe paroxysms of pain and a bloody stool. At 12:30 p. m., the physician found a tumor about the size of a chestnut a little to the left of the umbilicus. At 2 p. m., three hours after the beginning of the illness, the patient was operated on and the cecum, appendix and last portion of the ileum were found in the transverse colon.

At operation the appendix was removed and the cecum fixed to the abdominal wall. Toxic symptoms, such as fever, vomiting, disturbance of the sensor-

ium and deep breathing soon followed. Postoperative treatment consisted of hypodermoclysis of glucose, Ringer's solution and water by mouth, and 10 cc. of breast milk every hour. As the tolerance increased the amount of breast milk was increased, with a longer interval, and recovery was uneventful.

TWO CASES OF CONGENITAL DIAPHRAGMATIC HERNIA. LUIS OPAZ, Arch. Chilenos de Pediat. **3**:208, 1926.

The first patient was found to have a diaphragmatic hernia, when a roentgenogram was taken for suspected tracheobronchial adenopathy. The transverse colon protruded through the diaphragm. The child had pertussis at the time, and operation was deferred. The presence of an umbilical hernia and bilateral inguinal hernias led the author to investigate the family. Ten members of the mother's family were found to have hernia. This patient, therefore, represented a congenital debility at the hernial points. Three months later, when the pertussis subsided, the question of operation came up, and it was decided that as the child had withstood the severe paroxysms of cough, it would probably do well without operation and this should be resorted to only if symptoms of strangulation appeared.

The second case, a bronchopneumonia in an infant, aged 13 months, gave such bizarre physical signs, that the roentgen ray was resorted to and more than half the stomach was found projecting through a hernia in the diaphragm. The peculiar sounds heard on auscultation when the patient swallowed, in the presence of bronchopneumonia, made the clinician think of effusion and pneumothorax, and an attempt at aspiration was made before the true condition was accidently found.

DWYER, Kansas City.

NEPHRECTOMY IN PYELITIS PURULENTA. F. BRUNING, Klin. Wchnschr. **5**:1653, 1926.

Bruning, after reviewing the recent investigations of Faerber and Latzky in Czerny's clinic and those of others on the urinary infections of infancy, concludes that these infections are usually hematogenous and descending instead of ascending. In severe cases, he therefore advises early operative attack of the affected kidney as an important curative measure. The diagnosis of involvement of the kidney must first be made by examination of the urinary sediment and by cystoscopy and ureteral catheterization. Bruning cites several instances to show that such involvement of the kidney is frequently unilateral, therefore permitting nephrectomy. In severe pyelitis of infancy, when improvement has not taken place after ten days, or when on the contrary a pyemic temperature curve prevails, operative measures are indicated.

SCHWARTZ, Milwaukee.

Miscellaneous

MATERNAL AND INFANT MORTALITY. HAROLD BAILEY, Am. J. Obst. & Gynec. **12**:817, 1926.

Dr. Bailey covers the work done and the results secured in the teaching service of Cornell University for the last four years. The total number of visits antenatal, natal and postnatal was 74,207; 19,294 were made by doctors and students, 41,125 by nurses and 13,788 antenatal and postnatal visits were made by the patients to the clinic. Forceps were used 166 times with a fetal mortality of twenty-three; two of these fetuses were macerated. There was not any

maternal mortality. In the 226 cases of breech and version and extraction, there was a fetal mortality of 17 per cent.

In 150 cases of contracted pelvis there were two maternal and six infant deaths.

ALLEN, Chicago.

THE RELATIONSHIP OF PHYSICAL DEFECTS, THE INTELLIGENCE QUOTIENT AND THE QUALITY OF SCHOOL WORK. A. T. BEGGS, Practitioner **117**:392 (Dec.) 1926.

As a result of the study of school children, retarded three or more standards, it is the author's opinion that there is a preponderance of physical defects in retarded as compared with average children, and these conditions account to a marked extent for the retardation. Seventy-four per cent of the cases investigated showed an intelligence quotient of 60 to 80, and 76 per cent of the defects appeared in these groups. The intelligence quotient (I. Q.) is the ratio of mental age, estimated by intelligence tests, to chronological age. The mental age is divided by the real age expressed in years and months.

The school work most affected was calculation, and next in order reading, memory, writing, attention, observation, imitation and color. The relationship between failure in school qualities and physical defects is greatest with defects of the nose and throat, and next in order, defects of the teeth, vision, cleanliness and deformities.

In dealing with retardation in children, a distinction into two groups is necessary: (*a*) innate and (*b*) acquired. In diagnosing the mental state of a child, it is important to bear in mind the present physical and mental condition, personal history, family history, environment and home conditions. It is important to distinguish between limitation and mental deficiency. Correction of defect as regards treatment is carried out, and there is also advice on the use of thyroid extract.

GELSTON, San Francisco.

REPORT ON INFANT WELFARE WORK IN KUALA LUMPUR, FEDERATED MALAY STATES, FOR THE YEAR 1925. M. JOSEPHINE WERE, 1926.

The center had 16,005 infants in attendance in 1925 as compared to 9,106 in 1924 and 5,777 in 1923. New room was provided for the various needs of the work. Beside the usual infant welfare work those at the center had to care for sick infants, provide antenatal care, and give venereal treatment. Educating the mothers was an enormous task, and the center was so situated that this had to be done in four different languages. The health visiting nurse was one of the most important phases of their work, and it was through her almost entirely that any advance in meeting contagious problems was made.

BARNETT, Chicago.

Society Transactions

CHICAGO PEDIATRIC SOCIETY

Regular Meeting, Nov. 16, 1926

GEORGE E. BAXTER, M.D., *President, in the Chair*

ANOREXIA IN INFANTS. DR. ISAAC A. ABT.

The subject of anorexia in infants and children is not a new one. The ancients referred to it in a casual way, though it was first described by Gull in 1874, who gave it the name that it still retains.

Loss of appetite in children is undoubtedly a symptom due to a variety of causes. Young infants probably can differentiate the taste of one substance from another, though aversion for food probably is not the result, in most instances, of distaste. An infant who suffers from anorexia will refuse sweet foods as readily as any other kind.

In recent years the hunger contractions of the stomach in infancy have been studied by various investigators, particularly by Carlson. He asserts that the empty stomach of the new-born infant shows periods of hunger contractions before the infant has had any experience with food. Hunger periods are more frequent in infants than in adults. It has been shown that in new-born and young infants the quiescent time of the empty stomach lasts from ten to sixty minutes, while in the adult the same period lasts from one to three hours. In normal breast-fed infants the average time of hunger takes place about two and one-half hours after a full meal.

Anorexia occurs in a great number of conditions. It occurs in bronchitis, acute respiratory infections or pneumonia, catarrhal jaundice, malaria, pellagra, acrodynia, severe circulatory and kidney diseases; in fact, it is observed in any acute or chronic febrile disorder. Premature babies and those suffering from infantile scurvy, tuberculosis of the bronchial glands and pyelitis also have anorexia. Loss of appetite also may be the result of intense emotion or may occur in children who are preoccupied in their games or play. Anger, rage and excessive mental stimulation tend to suppress appetite, while, on the other hand, conditions that conduce to rest and mental calmness stimulate appetite. A monotonous diet is sometimes thought to be the cause of loss of appetite. Some children will take the same food day after day, and others require frequent changes. A long continued milk diet, lasting sometimes until the end of the second year, is frequently the cause of anorexia as well as constipation. It is a well recognized fact that these children become pale and weak and the muscles become atonic; the children fatigue easily, desire to sleep and are not inclined to play or exercise. Pawlow is on record as saying that "appetite is gastric juice"; in other words, when there is a diminished gastric secretion appetite is lost. On the other hand, there may be complete loss of appetite with an undiminished amount of gastric juice.

It also has been shown that in experimental fever such as occurs after the injection of typhoid vaccine normal hunger pains may become diminished, or if the fever reaches a high point gastric secretion may cease. It also has been

suggested that anorexia may be the result of diminished basal metabolism, and in several instances children have been given thyroid gland substances with apparently though not definitely good results.

Treatment.—Since loss of appetite in infants and children depends on such a variety of causes, it is difficult to outline a form of treatment that is applicable in all cases. At the same time it probably is true that decreased inclination for food is encountered most frequently in nervous children. Many forms of treatment have been suggested, and there still is a wide difference of opinion as to the best methods to be employed. In general, a monotonous diet should be avoided. Long continued or exclusive milk diets, as has already been noted, tend to produce anorexia and anemia. In some instances the patients have been starved. One author suggests a fast of four days for these patients, though no result has been obtained in this manner. The condition under consideration is frequent in neurotic families, especially when there is an only child; it sometimes is seen in families in which there are a number of grown children and long afterward a baby comes into the family, who is petted and fondled by parents, brothers and sisters alike. The story is told over and over again that if these children are forced to eat they almost invariably vomit. Thus, pediatricians frequently have to contend not only with anorexia but also with vomiting, which is equally troublesome.

The success in treatment depends on the cooperation of the parents with the physician. Frequently the father and mother present their child to the physician and are obsessed by the idea that the child will not eat. All directions are futile. All remedies or methods of management are received with doubt; in other words, it is frequently impossible to secure the cooperation of the parents. For this reason, it is sometimes necessary to separate the patient from the family or possibly to isolate him with a well qualified nurse. It is advisable to let the child feed himself. How frequently one hears worn out parents say that they have sung to the child, told him stories, set the phonograph in motion, and have done all sorts of odd things to distract his attention so that he would eat. Parents frequently relate in the child's presence that he never has had an appetite since he was born, and the child nods with assent and seems to enjoy the situation. Bertram Russell in his recent book tells the story of his child who refused to eat his pudding, whereupon it was sent out to the kitchen. Shortly afterward the child wanted the food, but it turned out that the cook had eaten it. He was much provoked and was careful afterward to eat his pudding before the cook got it.

It is not harmful if a child misses a meal occasionally. In many of these families meal time is a horrible nightmare. It is the time when the drama is staged with the child as the chief figure. Various suggestions have been made to increase the child's appetite. The food should be served in attractive dishes. The meals should consist of plain, nourishing food given at definite hours. There should be long intervals between feedings. Frequently, three meals a day suffice. Vegetables should be prepared so that they have a good taste. The food may be concentrated so that a small quantity mixed with a substance of high caloric value will meet the child's energy needs. The subject of feeding should not be discussed in the presence of the child. He should be fed quietly without excitement, and should be managed without threats or violence and without causing fear. Frequently it is necessary for parents to put their own house in order. Quarreling, rage and discontent affect the labile nervous system of the child unfavorably. All of the hygienic conditions that are essential in the successful rearing of a child such as fresh air, sunshine and play should

receive proper attention. There are those who maintain that force should never be employed, indeed that it is not necessary. I believe this is correct up to a certain point. On the other hand, I have seen children whom I am sure would have died from starvation if they had not been fed by insistent perseverance. Indeed in some instances feeding with the tube has been necessary. Forcheimer, one of the earlier students of this condition, mentions two children who died from actual starvation.

DISCUSSION

DR. JOSEPH BRENNEMANN: Dr. Abt has given us an instructive and comprehensive review of the whole subject and has brought out many excellent points. One thing should be emphasized and brought into greater relief. When anorexia in children is thought of, one clinical picture crowds out all the others, that of the otherwise normal or nearly normal child beyond infancy who is brought to the physician because "he will not eat." This is the major complaint in probably 50 per cent of the children seen. When such a large percentage of otherwise normal children have a common complaint, it is hardly probable that there is a physical basis back of it, and it is even less probable that a large number of physical factors contribute. The fault is not in the child but in the environment. The anorexia is a normal reaction to a pathologic environment and is wholly psychologic in nature. That it has nothing to do with hyperacidity, altered metabolism or the liver is evident from the simple fact that if the environment is altered favorably the condition is cured. That anorexia may arise from a host of conditions and that these always should be excluded by careful physical examination is axiomatic, but the main feature has nothing to do with the altered physical state.

How can such a condition be explained on a psychologic basis? Man has an innate negativistic tendency, witness the reaction to prohibition! Furthermore, he loves to be distinctive. The child has a normal atavistic cruelty and commonly loves to hurt his mother's feelings. A condition arises that robs the child, for a time, of his appetite. All children must gain all the time. The government has even set a standard of weight and height that has the authority of Gospel all over the land, so the process of forced feeding begins, accompanied by endless discussion in his presence, by coaxing, teasing, distracting, cajoling, threatening, etc. The child now exercises his negativistic tendency; he refuses to be made to do a thing. He becomes a distinctive personage, and revels in it — he "doesn't eat vegetables." That is "the kind of a guy he is!" He knows that he is hurting his mother's feelings and enjoys it in true childish fashion. In the orphan asylum, the hospital ward, even in the good old fashioned large family, this anorexia rarely occurs. There only the sick child refuses to eat. The cause for this condition may be evident; if so, the treatment follows logically, but it may be hard to carry out. An important point in prophylaxis is to enjoin mothers at every opportunity never to attempt to force their children to eat, and never to discuss the fact that they do not eat in their presence.

DR. LOUIS W. SAUER: I agree with Dr. Brennemann. There are many cases (by no means all) that seem to me purely psychologic. For many years I thought that children who did not eat well should be fed just three meals a day and that the feedings should be far apart. In many cases there was no increase in weight, and the children were fed small quantities of food five or six times a day; if they would not eat, the food was taken away. A change in the environment often would be helpful. In this five or six meal diet, most

of the milk is given between meals, not with the meals. Water is not given, and the children have breakfast and supper in bed. This plan is much better than trying to force three large meals a day.

DR. WILLIAM B. MCCLURE: The frequent occurrence of lack of appetite in children in my opinion is largely due to the fact that parents have been taught, principally by physicians, to expect a certain gain in weight in their child each day or week, and when this gain is not forthcoming efforts commonly are made to have the child take more food.

In the presence of anorexia the effort should be concentrated on restoring the appetite rather than on securing a gain in weight or the intake of a particular quantity of food. In general, the simplest and surest way to improve appetite is, of course, to reduce the quantity of food given or to withhold it entirely for a short period, and the most certain way of destroying an appetite is to urge food when it is not desired. Permanent benefit is not secured for the child with anorexia just because one succeeds in getting him to swallow a certain quantity of food at a particular meal. The cure is effected only when the child actually wants the food.

The parents and grandparent of a certain child were having great difficulty in getting him to take the quantity of food they had decided he should have. The entire mealtime was taken up with efforts toward this end with poor results. At periods a trained nurse would take charge of the child's feeding and all would go well, but as soon as she would leave the trouble promptly returned. I was called in when the child was having an attack of cyclic vomiting. The parents were told that with the subsidence of the vomiting attack the child would develop a good appetite and that if nothing was done on their part to destroy this appetite, their difficulty in having him eat normally would be ended. The patient was old enough to feed himself, and the parents were instructed to give him a spoon, place the proper foods before him (not too much), and let him feed himself without interference of any sort. During a considerable period in which I heard from the parents there was no further trouble with meals. Recently, a physician consulted me concerning anorexia in his child of about 18 months of age. Forced feeding, concentrated food and similar measures were being used, with the result that the child vomited at practically every meal. I gave the usual advice for these cases: the appetite was the thing to keep in mind; to forget for a time the quantity of intake of food and gain in weight; the child should be required to feed himself as far as practical. To my surprise the physician gave this plan a trial. He reported in a few weeks that the child was taking the food willingly and without vomiting for the first time since the onset of the anorexia.

I am convinced that the type of anorexia under discussion is principally psychic in origin. Less emphasis should be placed on uniform daily intake of food and continuous gain in weight, and more on desirability of preserving the appetite.

DR. A. LEVINSON: I am afraid that a great many of you may go away thinking that every case of anorexia is psychologic in nature, and I wish to sound a note that is a little different from most that has been said this evening.

I have had a child under my care who came to me with the complaint in anorexia is the mental reaction of the patients. It seems to me decidedly I talked to the mother along the line Dr. Brennemann suggested, but she returned a second, third and fourth time. Later I took the child into the hospital, but could not find anything pathologic. A few months later I again took the patient into the hospital, and roentgen-ray examination showed that

the appendix did not empty itself. A few months later the liver became enlarged. Surprisingly enough, it gradually decreased in size but the child's condition became progressively worse; headache was complained of and a week or ten days later he went into coma and died. I do not know what was the cause of death, but I am sure the anorexia in this case was due to an organic disease. In another case of anorexia I could find nothing pathologic at first. The tonsils and adenoids had been removed, but the anorexia persisted. Because of occassional tenderness in the right lower quadrant I advised the removal of the appendix, and as soon as this was done the child began to gain in weight.

Perhaps most of the cases of anorexia are psychologic, but I think that every case should be carefully investigated. Since the two experiences that I have mentioned, I have had several other patients, and I think some of them have nasal obstruction and at times some real organic disease.

Dr. H. E. Irish: I agree with Dr. Levinson and am sure Dr. Abt would not want the impression carried away that the only thing physicians consider in anorexia is the mental reaction of the patients. It seems to me decidedly unfair for any one to decide that an infant or a child is affected only psychologically without a thorough physical examination. All the things Dr. Abt mentioned should be considered before it is finally decided that anorexia in a child is purely psychologic. It must be remembered that physical diseases occasionally are surrounded by psychopathic parents, and that in some instances the long continuation of complaints makes the parents psychopathic. A few years ago a neurotic Jewish mother annoyed me very much because of the condition of her child. Finally I placed the child in the hospital, and although he was only 4 years old complete gastro-intestinal tests showed that he had a gastric ulcer. The condition cleared up under the usual treatment for ulcer. Recently, at the Cook County Hospital, I saw an infant, aged 18 months, with a gastric ulcer and hour-glass stomach.

The possibility of tonsillar or catarrhal infection in the upper respiratory tract always should be remembered. Many years ago Turck emphasized the relationship between these infections and gastritis. The stomach is the cuspidor of the child under 5. He does not expel the secretions from the upper respiratory tract, but they are deposited in his stomach. Many children with mucus in the throat do not like to eat breakfast; they will not take cereals or milk if it is thick. They often will take the cereals or milk if they are diluted. If the infection in the upper respiratory tract is cleared up and infected tonsils are removed, the results are remarkable in many of these cases. Many of the cases of anorexia are described as "memory symptoms," dating back to a catarrh of the upper respiratory tract when an aversion was formed for food. I have had some success by giving sour things to children who would not eat other things. Pickled herring is a home remedy for many children. Orange juice often is taken when other things are refused.

Medicine has not been discussed, but the salicylates and alkalis and arsenic are still good remedies in these cases. Arsenic still has some action in increasing metabolism of the tissues, and so affects the gastric juice (Cushny). Gentian has lost some of its vogue since Carlson published his experiments. These drugs are of assistance in cases in which nervous parents are impressed with their utility, and perhaps help in themselves.

Dr. C. A. Aldrich: I should like to mention one thing that might be done about anorexia which, at the present time, is not generally done. Pediatricians should decide among themselves what is the matter with these patients and then should institute a definite campaign of propaganda to let people know

about it. In that way this problem could be met before the cases are long established. Most of the patients frequenting physicians' offices come after they have gone through several weeks or months of feeding difficulties.

It should be made a practice to tell mothers something about nervous anorexia when their infants are born. They should be asked to report the first sign of poor appetite just as quickly as they would report vomiting, diarrhea or any other symptom. Perhaps if the normal mechanism of eating were studied, it would throw some light on this subject.

Vague ideas about hunger and appetite are expressed. I recently looked in the dictionary to find out what hunger and appetite were. I found that hunger was a painful sensation located in the stomach and that appetite was a pleasant desire for food. Hunger, as Dr. Apt brought out, is the result of hunger contractions that take place in the wall of the stomach. This is a purely physiologic affair. Appetite, on the contrary, is a psychologic function of the brain. Appetite is a pleasant memory complex. One can conceive of the act of eating as a reflex inaugurated by hunger contraction, the path of the reflex being as follows: hunger contractions, consciousness of discomfort, associated paths leading to thoughts of food (relief of pain), pleasurable memories of food, thoughts of how, when and where one is going to eat and finally the act of eating. This gives an idea of just what is going on in the child's mind at each meal.

The problem of appetite brings up the question of interference with this normal reflex. Possibly by studying its vulnerable points, one may arrive at a solution of the problem.

Clinical Meeting, Children's Memorial Hospital, Dec. 14, 1926

JOSEPH BRENNEMAN, M.D., *in the Chair*

FACIAL PARALYSIS. RESULT OF TUBERCULOSIS OF MIDDLE EAR AND CERVICAL GLANDS. DR. GEORGE E. BAXTER.

This girl, aged 4 years and three months, has a left sided facial paralysis and, as a result, talking is difficult. She came to me when she was 6 months old with discharge from both ears and a swelling in the right side of the face extending to the mouth and a fluctuating mass, the size of an orange, beneath the left ear. The tongue was dry. The mass was opened and a small amount of light colored pus discharged. A Pirquet test was positive. Roentgen-ray treatments were given. About two months later she developed a facial paralysis, which is still present. She was given quartz light treatments for several months with a marked decrease in the swelling of the glands and with a definite decrease in the discharge from the ears. She finally made a complete recovery as far as the discharge and the glands were concerned. Dr. George W. Hall advised electric treatment for the paralysis. This was tried without any result being obtained. Also under his advice she was operated on in September at the Mayo Clinic, an anastomosis of the spinal accessory and facial being performed. During the dissection some of the tuberculous glands were removed. Since operation there has been a little fistula on the left side and a flat swelling of the gland on the right side. Just recently she developed a phlyctenule in the right eye.

I do not know what the prognosis is as a result of the operation. She is making some improvement, but the improvement is particularly in the general state of nutrition.

PERSISTENT JAUNDICE. DR. GEORGE E. BAXTER.

This child will be 3 years old in January. I first saw her at the age of 9 weeks. The birth weight was 9 pounds 13 ounces (4450.8 Gm.); the weight at 9 weeks was 7 pounds 15 ounces (3600 Gm.). There was a history of jaundice appearing on the third day of life. This jaundice has persisted and is still present. The interesting thing about it is that the child's liver has remained practically the same relative size since first seen. There has not been any change in the size of the spleen. During the last six months, there has been a noticeable decrease in the jaundice. The latest development is a marked change in the skin, which was diagnosed as a xanthoma multiplex. The prognosis by the dermatologist is unfavorable. He ascribes the lesion entirely to the presence of bile in the skin. He thinks there is a possibility that it might have occurred early enough to have been an obstruction. I hardly think that is likely, as the jaundice began when the child was 3 days old. At present, she appears to be normal with the exception of the jaundice.

INTUSSUSCEPTION. DR. ALBERT H. MONTGOMERY.

This child came to me in October with a definite history of intussusception and classic symptoms. There was nothing about the patient that was striking except that she was toxic, somewhat dehydrated, was vomiting and had a tumor mass in the abdomen. She was operated on about forty-eight hours after the onset. The intussusception could be reduced up to the last 2 or 3 inches and then it stuck. In my experience with intussusception this is the difficult stage with which one has to contend. In this case I tried something I had never tried before. I simply stopped the intussusception from going down any further by a few interrupted stitches around the intussusception ring and then made a lateral anastomosis between the two loops of bowel. The result was excellent. What became of the intussusception I do not know. The stools were watched for about four weeks, but any sloughing of the tumor mass was never seen.

CONTRACTION FOLLOWING A BURN. DR. ALBERT H. MONTGOMERY.

This child came to me with a contraction of the hand following a burn. A flap of skin was taken from the abdominal wall and put on the palm of the hand. The graft healed in nicely.

TUMOR OF THE SECOND CERVICAL VERTEBRA. DR. ALBERT H. MONTGOMERY.

This boy came to us when he was 8 years of age, with a history of a blow on the tibia six months previously which caused a lump. This finally subsided. About four weeks before admission his parents noticed a swelling on the back of the neck about the size of a small orange, painless and freely movable. A roentgen-ray examination revealed a tumor mass growing from the spinous process of the second cervical vertebra. The Wassermann test was negative. At operation the mass was dissected out and was found to extend down to the spine. It seemed to come from the marrow in the spinous process of the second cervical vertebra. The section of the tumor mass was examined by Dr. LeCount and was found to contain an enormous number of eosinophils. It seemed to be an inflammatory type of tissue.

About the same time, Dr. Berkheiser had a similar case, which he will report, which led me to make a further investigation. I took a roentgenogram of the skull but did not find any evident defects. Undoubtedly, Dr. Berkheiser's case is characteristic of the group described by Christian in 1915. The question that came up was what was the relation between the case of Dr. Berkheiser and mine. They both had the same histologic symptoms. The thing that has struck the men who have seen the section in my case is that it is not a tumor. We are suspicious that this may be a case of Hodgkin's disease beginning in the bone.

LENTIGO GENERALIZATUS. DR. CLARK W. FINNERUD.

A girl, aged 9 years, American born but of Polish descent, had an eruption of the neck, trunk and extremities of two years' duration and devoid of subjective symptoms, most marked on the back and sides of the neck where it was first noticed. Within a few weeks after its appearance on the neck, similar brown spots were noticed on all surfaces of the trunk, thighs, legs, arms and forearms, although the majority of the lesions on the body had appeared within the last six months. The child's foster-mother stated that the patient had always had an unusually fair skin, with not a freckle on it, until these brown spots appeared. The child had a brother and sister, both living and well and without any history of skin disease. The patient was one of twins, full term, and was said always to have been more delicate than her twin sister, but aside from having bronchitis and tonsillitis every winter, she had always been in good general health. The tonsils had been removed recently.

Examination shows numerous discrete, round, oval and irregularly shaped light brown macules of the neck, trunk and extremities, most marked on the neck and extremities and about the size of a match, or a pea, or larger. There are not any lesions on the hands, feet or face, and the mucous membranes of the mouth are of normal appearance. On the forearms and legs, this light brown discoloration is practically diffuse, and in the popliteal spaces it is of vitiliginous appearance. The lesions did not urticate with rubbing. There is possibly some reticulated atrophy of the skin of the neck and shoulders behind. The Wassermann reaction is negative and the Pirquet test weakly positive. The urinalysis is negative, and the blood chemistry readings are as follows: urea, 34 mg.; urea nitrogen, 11 mg.; uric acid, 2.7 mg.; creatinine, 1.05 mg.; sugar, 93 mg.; nonprotein nitrogen, 30 mg.

Pulse, respiration and body temperature are normal, as is the differential leukocyte count of blood. A roentgenogram of the chest shows increased lung shadows on both sides with innumerable shadows of small calcified glands at each hilum and some fibrosis in the upper lobes. The basal metabolic rate is plus 7. Histologic sections do not show any pathologic changes other than heavy pigmentation limited to the basal cell layer. This pigment is iron free and apparently is melanin.

The case is presented as one of generalized lentigo, similar to that recorded by Knowles (*J. Cutan. Dis.* **30**:83, 1912), a rare condition. The face and hands being clear, photosensitivity, which usually plays a definite rôle in "freckles," is not a factor. At a recent meeting of the Chicago Dermatological Society, several observers considered atypical forms of other disorders, xeroderma pigmentosum, Recklinghausen's disease, malignant lentigo, vitiligo and syphilis as possible causes. Time, with further development of the case, may clarify the diagnosis.

TROPHIC CHANGES IN THE NAILS. DR. A. L. NEWCOMB.

This child has had unusual trophic changes in the nails ever since birth. The mother's hands show a type of stunted nail that came on at the time the child was born, about seven years previously. It was her third pregnancy, and she vomited a great deal. Sometimes she would eat only bread and milk. The child's nails are thin and hollow both laterally and anteroposteriorly.

PLASTIC SURGERY FOR BURNS OF NECK AND AXILLA. DR. EDWIN M. MILLER.

This girl came into the hospital in December, 1923, having been burned two weeks previously by spilling hot cocoa over the neck, chest and arms. On admission, the wounds were badly infected, and the first task was to get them perfectly clean. Two problems then were presented: (1) to cover the entire anterior half of the neck with soft, pliable skin and preserve full range of motion of the chin; (2) to preserve full use of the right arm. At the first operation a pedicle flap was taken from the left shoulder to cover the left side of the neck. When this had healed entirely, a series of advancement operations were performed to bring the skin from the back forward a little at a time to cover the right side of the neck. After completing the operations on the neck, which required a series of seven operations during a period of two years, I took a large flap from the back and placed it across the axilla, after dissecting out all the scar. As a result the patient has good use of the arm as far as function is concerned, in spite of the fact that there has been a tendency toward keloid formation.

CASE OF POTT'S DISEASE (?). DR. E. J. BERKHEISER.

This boy was brought to the dispensary about three years ago and admitted to the hospital with a provisional diagnosis of Pott's disease because he had an angular kyphosis on the back, pain radiating around the abdomen, and stiffness in the back with involuntary muscle spasm. As I looked into the case further, I was struck by some peculiar nodules that were scattered over the scalp. These were neither solid nor fluctuating. Some roentgenograms were taken, and a biopsy was performed on one of the nodules which showed that the space was occupied by a semifluctuating material that was reddish grayish. It did not come out with the curet in one piece, and several instruments had to be used in order to remove all the material. I found that this opening extended through the deep layers of the skull down to the meninges. The wound was closed without drainage, and a microscopic study was made of the material. It was found to be composed of cells in which the eosinophilic type predominated. The patient stayed in the hospital about a month, during which time he was kept lying on a Bradford frame because of the condition of his back. The curious thing about this case is that he has gone on to a clinical cure or recovery as far as I am able to make out. Before he came to the hospital he was a puny youngster, never very well, but since that time he has improved.

CONGENITAL SYPHILIS. BISMUTH POISONING. DR. H. A. ROSENBAUM.

This patient came to the hospital after a severe vomiting attack. On examination it was found that the pupils did not react to light or in accommodation. The deep tendon reflexes were present. There were not any disturbances in cutaneous sensation. Sphincter control was good. The Wassermann reaction on the blood and spinal fluid was 4 plus. The colloidal gold test on the spinal

fluid gave the typical reaction of tabes. Since last May the patient has had recurrent vomiting attacks, as frequently as every four days and again she would be free from attacks for as long as three weeks. Along with the vomiting attacks the blood pressure takes a sharp rise of 40 or 50 points. She has some pain before the attacks. A diagnosis was made of juvenile tabes. We had a similar case about two years ago in a girl of 6, who was under observation for two years. She had nonreacting pupils, a positive reaction in the spinal fluid and the crises described.

In contrast to this patient, I want to describe a colored boy who came to me last March. He is 10 years old. The mother had two miscarriages at four and six months before his birth. This boy did not receive treatment until he was 1 year of age when he was taken to Northwestern Medical Dispensary and given some white pills. The mother gave him these for a month and, not understanding that she was to return, discontinued treatment. He did not have other treatment until the age of 6. At that time he began to run into things and fall over objects. He was taken to a physician, who said that the trouble was in his eyes and he could not be helped. He is now totally blind, but is clear mentally. Subsequent examination of the fundi showed complete optic atrophy. The deep tendon reflexes are gone. There has never been any trouble with the sphincters, or any disturbance of cutaneous sensation. There are not any trophic disturbances. The Wassermann reaction on the blood and spinal fluid is 4 plus, and has the typical tabetic curve.

This next patient is 11 years old. On admission to the hospital, the urinalysis showed a heavy trace of albumin. On examination the epitrochlear glands were found enlarged to the size of walnuts. She had typical notched, upper middle incisors, shaped like a screwdriver. The Wassermann reaction was 4 plus. In spite of the nephritis she was given three doses of arsphenamine, the first 0.2 Gm., and the next 0.3, at intervals of one week. Following the third dose, a bright red maculopapular rash appeared on the external surface of the upper and lower extremities, and across the bridge of the nose. It was suspected that the patient had an idiosyncrasy to arsenic, so she was placed on bismuth potassium tartrate in doses of 0.1 grain a week, which was later increased to 0.2 grain once a week. Everything went well until she had been taking the bismuth for two months, having received in all less than 1 Gm. Three days after the last dose she was brought to the hospital in a miserable and serious condition. The right side of the face was swollen, shiny and red, and there was a constant profuse drooling. She had a black metallic line at the gingival margins, and the roof of the mouth, soft palate and pharynx had a blackish infiltration. On the right cheek was a black ulceronecrotic lesion that made one think of noma. This condition persisted for about a week, and then she gradually improved. There was not any increase in the amount of albumin in the urine during this severe bismuth poisoning and the patient is now comfortable. She was given seven injections of sodium thiosulphate.

DISCUSSION

DR. BRENNEMANN: This child was really much more ill than one would imagine from Dr. Rosenbaum's description. We did not know whether she would survive. Her symptoms were exactly like those described by Cushny fifteen years ago. I have never seen such salivation; the saliva ran out of her mouth constantly. Evidently it was a typical case of severe bismuth poisoning, possibly made worse by the fact that she had a nephritis, probably on a syphilitic basis.

DR. GRULEE: I once saw a case of bismuth poisoning from the use of Beck's paste.

HEMORRHAGE FROM A MECKEL'S DIVERTICULUM. DR. BRENNEMANN.

A child recently came to the clinic with a hemoglobin of 20 per cent and severe hemorrhages from the bowel. Transfusion was performed and everything possible was done, but she died because the Meckel's diverticulum had perforated and a peritonitis resulted. In three cases reported by Dr. Strauss and Dr. Abt, peritonitis was not present, and the patients all lived.

The main theory about the cause of perforation is that there is a misplaced gastric mucosa. There is the same condition that produces a peptic ulcer elsewhere which penetrates through. In this type of Meckel's diverticulum there are protracted hemorrhages over a long period of time until perforation finally occurs. I am indebted to Dr. Abt and Dr. Strauss for calling attention to this condition as a cause of hemorrhage from the bowels and not as merely an interesting pathologic entity. In retrospect, I have had several such cases.

CASE OF PURPURA HEMORRHAGICA WITH CEREBRAL HEMORRHAGE. DR. N. J. WELFORD.

This girl is 8 years of age and shows many petechial hemorrhages into the skin, most marked over both legs. When she came into the hospital twenty months ago she was comatose and showed a complete hemiplegia following a cerebral hemorrhage. A tooth had been extracted three months previously from which she bled for seven days. Since that time she has continued to have these petechial ecchymoses, the hemorrhages varying in size from that of a pinhead to a half dollar. The platelet count has been as low as 75,000 but on two occasions went as high as 230,000. The coagulation time is normal. From the standpoint of treatment the advisability of splenectomy was considered, but was not performed as the patient is getting along so well, going to school every day, and as these patients having purpura, I have found, usually get well without splenectomy.

SARCOMA OF THE CHEST. DR. PEACOCK.

A boy, aged 12 years, who came into the hospital on December 7, six months previously developed a lump in the left side of the chest which kept growing larger. The mother consulted several physicians and finally took him to the Mayo Clinic where a diagnosis of sarcoma of the chest was made. He was sent home without operation. When he was admitted here there was a definite mass in the left chest that measured 11 by 10 by 5 cm. A frozen section was made which showed that some of the cells were compatible with sarcoma, while others slightly resembled carcinoma. He died last night.

Book Reviews

KLINISCHES LEHRBUCH DER INKRETOLOGIE UND INKRETOTHERAPIE. Herausgegeben von PROFESSOR DR. GUSTAV BAYER, PROFESSOR R. VON DEN VELDEN, unter mitabreit von: Privatdozent Dr. Bernhard Aschner, Primarius Dr. Robert Bachrach, Professor Dr. Leo Borchardt, Professor Dr. Franz Kobrak, Professor Dr. Richard Koch, Professor Dr. Max Rosenfeld, Privatdozent Dr. Stephan Rothman, Professor Dr. Erwin Schiff, Professor Dr. Aurel von Szily und Oberarzt Dr. Fritz Poos. Pp. 423, with thirty-seven illustrations. Price, M 29. Leipzig: George Thieme, 1927.

This volume presents in a most comprehensive manner the subject of endocrinology and endocrine therapy in its relation to all phases of medicine, each phase written by an authority in his own field. It is based on personal experiences of the authors and largely on European literature, there being only an occasional reference to American literature. A brief historical sketch of the development of endocrinology and the names of some of the important contributors are ably presented by Koch. The structure and function of the organs of internal secretion under normal and pathologic conditions are discussed by Bayer. He elaborates on each organ of internal secretion as to its development, embryology, anatomy, physiology, pathology, experimental significance (extirpation, transplantation, hormone action, etc.), relation of one gland to another under pathologic conditions and the relation of such glands to other organs and glands of the human body not internally secreting. The organs Bayer regards as internally secreting are the thyroid, parathyroids, thymus, hypophysis, pineal gland, suprarenals, pancreas, testes, ovaries, corpora lutea, placenta, myometrial glands and mammary gland.

Von den Velden calls attention to the general clinical significance and the diagnosis of disturbances of the organs of internal secretion whether deficient or excessive, such diagnoses often resting on physiologic, chemical or pharmacologic investigations. In the therapy of endocrine disturbances, he calls attention to the injections of the active substances, transplantations, stimulation, sedative drugs, diet, the value of the interstitial tissue and the vegetative nervous system.

In a discussion of the various clinical entities in disturbed endocrinology, Borchardt takes them up from the standpoint of definition, symptoms, course, pathologic anatomy, etiology, nature of the disturbance, diagnosis, prognosis and treatment. His writing on "pluriglandulare Erkrankungen" is complete, taking up in detail (*a*) sclerosis of the endocrine blood vessels, (*b*) a form of cerebral insufficiency, (*c*) the thyreosexual insufficiency and (*d*) infantilism in its various forms.

Having already discussed endocrine therapy in a general way, von den Velden directs attention to the important rôle played by the endocrine glands and their secretions in such conditions as infections, asthenia, disorders of the cardiac, respiratory, digestive, osseous, blood, genito-urinary, and the vegetative nervous systems and the climacterium. Rosenfeld points out the significance of the endocrine glands and their secretions to psychiatry in conditions of epilepsy, neurasthenia, maniac depressant, various psychoses and to the various neurologic diseases.

That endocrinology is definitely linked up with the field of pediatrics Schiff emphasizes by calling attention to its relations to the child as a whole and with special reference to status thymicolymphaticus, myxedema, cretinism, exophthalmic goiter thyroiditis, parathyreopriva, tetany, gigantism, acromegalie dystrophia adiposa genatalia, diabetes insipidus, disturbances of the pineal gland and disease of the suprarenal glands.

In a similar manner, Aschner discusses the relationship between endocrinology on one hand and obstetrics and gynecology on the other in considerable detail as related to puberty, menstruation and its disturbances, chlorosis, osteomalacia, amenorrhea, sterility from ovarian hypofunction, climacterium, pregnancy and the changes due to pregnancy that may occur in the various glands of internal secretion.

Likewise, Bachrach calls attention to the relationship of endocrinology to the subject of urology; Szily and Poos to the conditions in ophthalmology, Kobrak to conditions in otology, rhinology and laryngology, and finally Rothman to conditions in dermatology.

NUTRITION WORK WITH CHILDREN. By LYDIA J. ROBERTS, Assistant Professor of Home Economics, The University of Chicago. First edition. Cloth. Price, $3.50. Pp. 394 with fourteen illustrations. Chicago: The University of Chicago Press, 1927.

The purpose of this book is to present the problem of malnutrition as it affects childhood, together with practical methods for its eradication.

Probably nutrition has received as much attention in recent years as any other subject, but unfortunately this material is scattered through many magazines, journals and bulletins. In the opening chapters, all the material is brought together in one comprehensive survey. This deals with studies in height and weight, methods of judging nutrition, causes, effects, prevention and treatment of malnutrition. Numerous charts and graphic diagrams accompany the various studies, which are systematically treated.

The chapters on nutrition in the school and preschool child contain the method and results of prominent workers, as well as Professor Roberts' own work. One wishes that Professor Roberts had not been so modest in the description of her own results, for her methods are intensely interesting and the reader wishes for more about them.

The final chapters deal with suggestions of the parts that the different workers may follow in a school nutrition health program, with a résumé of the work of the national nutritional agencies. Parental and preparental education is also dealt with.

This book fills a long felt want in the field of nutrition. It gives not only a survey of the field, but much of the material needed for success in it. It not only answers as a textbook on nutrition, but also is so readable that parents as well as physicians and child welfare workers will enjoy its contents.

THE NORMAL CHILD AND HOW TO KEEP IT NORMAL IN MIND AND MORALS. By B. SACHS. Pp. 111. Price, $1.50. New York: Paul B. Hoeber, Inc., 1926.

This book summarizes conclusions arrived at after many years of scientific observation of normal and abnormal children by one of the foremost psychiatrists of this country. It is short, lucidly written, strikingly devoid of scientific terminology, and presented in an interesting manner. The subject matter is divided in two parts. The first deals with the development of the

normal child from infancy through adolescence. The writer assumes the attitude of the behaviorists: "Barring the small number of grossly defective and handicapped infants, every child at birth is potentially a normal creature." In the chapter on infancy such important problems as the attitude of the mother and formation of the early habits are discussed. Authority, imitation, tantrums and repression are among the items discussed in the chapter on the nursery and preschool period. The next chapter develops the adjustment of the child to its school environment. Perhaps the most important chapter deals with the complicated problems of puberty and adolescence. The second part of the book is an argument against freudian psychology.

This book may be safely recommended to parents.

CONGENITALE SYPHILIS. Edited by J. JADASSOHN. Pp. 357 with ninety-three illustrations. Price, Rm. 54 (bound). Berlin: Julius Springer, 1927.

This book, edited by Jadassohn, with sections by many of the outstanding men in Germany, is an extremely complete volume on the subject. It discusses in detail all the various phases of the transmission, clinical aspect, outlook and treatment of congenital syphilis. The cuts are fine and well chosen, and the bibliography is extensive. The book is fitted more for reference than for any other purpose and will be found complete in any line in which one wishes to seek information on the subject. The reviewer does not know of any phase of congenital syphilis that is not well and adequately taken up in this treatise. The prophylaxis of congenital syphilis is well treated by Boas of Copenhagen. This is a new subject and one that probably will receive more attention in the future. It has the attributes that usually are found in German books—thoroughness, a large bibliography and attention to detail. The knowledge of American literature apparently is not great. This, too, should be expected.

Directory of Pediatric Societies

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SECTION OF DISEASES OF CHILDREN

Chairman: Dr. Henry Gerstenberger, 2103 Adelbert Road, Cleveland.
Secretary: Dr. Hugh McCulloch, 500 Kingshighway, St. Louis.
Place: Washington, D. C. Time: May 18, 19 and 20.

AMERICAN PEDIATRIC SOCIETY

President: Dr. Isaac A. Abt, 104 S. Michigan Ave., Chicago.
Secretary: Howard Childs Carpenter, 1805 Spruce St., Philadelphia.
Place: Cruise on Chesapeake Bay. Time: May 12 to 16.

THE ASSOCIATION OF AMERICAN TEACHERS OF THE DISEASES OF CHILDREN

President: Dr. Frank P. Gengenbach, 452 Metropolitan Bldg., Denver.
Secretary: Dr. Paul W. Emmerson, 86 Bay State Road, Boston.
Place: Willard Hotel, Washington, D. C. Time: May 17, 1927.

AMERICAN CHILD HEALTH ASSOCIATION

President: Mr. Herbert Hoover, Department of Commerce, Washington, D. C.
Secretary: Dr. Philip Van Ingen, 125 E. 71st St., New York City.
Place: Washington, D. C. Time: May 9 to 11.

CANADIAN SOCIETY FOR THE STUDY OF DISEASES OF CHILDREN

President: Dr. Howard Spohn, 718 Granville St., Vancouver, B. C.
Secretary: Dr. Frederick F. Tisdall, 102 College St., Toronto, Ont.
Place: Toronto or vicinity. Time: June 13 and 14.

SECTIONAL

CENTRAL STATES PEDIATRIC SOCIETY

President: Dr. O. L. Goehle, 15703 Detroit Ave., Lakewood, Ohio.
Secretary: Dr. H. T. Price, 121 University Place, Pittsburgh.
Place: Cleveland. Time: Early in November, 1927.

SECTION ON PEDIATRICS OF SOUTHERN MEDICAL ASSOCIATION

President: Dr. Robert A. Strong, Pass Christian, Miss.
Secretary: Dr. Hugh L. Dwyer, Brotherhood Block, Kansas City, Kans.
Place: Memphis, Tenn. Time: Nov. 14 to 17, 1927.

LOCAL

CHICAGO PEDIATRIC SOCIETY

President: Dr. George Baxter, 4603 Broadway, Chicago.
Secretary: Dr. J. K. Calvin, 104 S. Michigan Ave., Chicago.
Place: City Club. Time: Third Tuesday of each month.

THE PEDIATRIC SECTION OF THE ACADEMY OF MEDICINE OF CLEVELAND

Chairman: Dr. Henry J. Gerstenberger, 2103 Adelbert Road, Cleveland.
Secretary: Charles W. Burhans, Lakeside Hospital, Cleveland.
Place: 2009 Adelbert Road. Time: Feb. 10, May 7, Sept. 22 and Dec. 15.

DETROIT PEDIATRIC SOCIETY

President: Dr. Thomas B. Cooley, 987 Jefferson Avenue, East, Detroit.
Secretary: Dr. W. S. O'Donnell, 1563 David Whitney Bldg., Detroit.
Place: Children's Hospital of Michigan. Time: No fixed date; approximately once a month.

LOUISIANA STATE PEDIATRIC SOCIETY

President: Dr. L. R. De Buys, 1487 Delachaise St., New Orleans.
Secretary: Dr. F. J. Kinberger, 3601 Prytania St., New Orleans.
Place: New Orleans. Time: April 25, 1927.

MEMPHIS PEDIATRIC SOCIETY

President: Walter L. Rucks, 1074 Madison Ave., Memphis, Tenn.
Secretary: Dr. J. B. Blue, Columbian Mutual Tower, Memphis, Tenn.
Place: Baptist Memorial Hospital. Time: Second Tuesday of each month.

NEW ENGLAND PEDIATRIC SOCIETY

President: Dr. James Herbert Young, 66 Commonwealth Ave., Boston.
Secretary: Dr. Thomas Lanman, 286 Marlborough St., Boston.
Place: Boston Medical Library. Time: Second Friday of each month.

PEDIATRIC SECTION OF THE NEW YORK ACADEMY OF MEDICINE

Chairman: Dr. Lewis C. Schroeder, 39 E. 61st St., New York City.
Secretary: Dr. William R. May, 8 East 66th St., New York City.
Place: New York Academy of Medicine. Time: Second Thursday of each month.

NORTHERN CALIFORNIA PEDIATRIC SOCIETY

President: Dr. C. F. Gelston, 384 Post St., San Francisco.
Secretary: Dr. Mary H. Layman, 2116 Pacific Ave., San Francisco.
Place: Alternates between Stanford University Hospital, University of California Hospital, and Children's Hospital. Time: Three or four times a season.

NORTHWESTERN PEDIATRIC SOCIETY

President: Dr. C. A. Stewart, 730 La Salle Bldg., Minneapolis.
Secretary: Dr. E. S. Platou, 730 La Salle Bldg., Minneapolis.
Place: Three at the Medical Campus, Minneapolis and one at the Town and County Club. Time: Winter, Spring, Summer, Fall.

PHILADELPHIA PEDIATRIC SOCIETY

President: Dr. Frederick Fraley (Retiring), Overbrook, Pa.
Secretary: Dr. John P. Scott, 2040 Pine St., Philadelphia.
Place: College of Physicians, 19 S. 22nd St., Philadelphia. Time: Second Tuesday of each month.

THE ROCKY MOUNTAIN PEDIATRIC SOCIETY

President: Dr. W. Wiley Jones, Majestic Bldg., Denver.
Secretary: Dr. Berryman Green, Republic Bldg., Denver.
Time: Third Saturday of each month, 2 to 4 p. m. Place: Childrens Hospital, Denver.

ST. LOUIS PEDIATRIC SOCIETY

President: Dr. T. Wistor White, Lister Bldg., St. Louis.
Secretary: Dr. Edwin Rohlfing, Grand Blvd. and Wyoming St., St. Louis.
Place: St. Louis Children's Hospital. Time: Third Friday in each month

SOUTHWESTERN PEDIATRIC SOCIETY

President: Dr. Joseph Shuman, 1136 West 6th St., Los Angeles.
Secretary: Dr. Wm. Sidney Bowers, 1136 W. 6th St., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.